Lake Gage and Lime Lake Engineering Feasibility Study

An Indiana Department of Natural Resources
Division of Fish and Wildlife
Lake and River Enhancement Project

December 16, 2005

Gensic Engineering Inc.

In Association with:

Aquatic Enhancement & Survey, Inc.
and
Blue Heron Ministries, Inc.

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Presented to:

Joe Weaver
Lake Gage and Lime Lake Association, Inc.
6080 West Orland Road
Angola, Indiana
260-833-2479

Prepared by:

Gensic Engineering Inc.
311 Airport North Office Park
Fort Wayne, Indiana 46825
260-489-7643
Contact Michael Gensic

In Association with:

Aquatic Enhancement & Survey, Inc.
P.O. Box 1036
Angola, Indiana 46703
260-665-8226

and

Blue Heron Ministries, Inc.
2955 West Orland Road
Angola, Indiana 46703
260-316-2498

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Part 1

Lake Gage and Lime Lake, two connected glacial lakes in Steuben County are 327 and 57 acres respectively. Lake Gage is one of only 13 Lakes in Indiana with water quality sufficient to support native Cisco *Coregonus artedi* an Indiana species of special concern. Because of ample coldwater fisheries habitat Lake Gage also receives yearly stockings of Rainbow Trout *Oncorhynchus mykiss*. Lime Lake has a diverse native aquatic plant community including the state listed threatened Robbins fern *Potamogeton Robbinsii* and the state listed endangered Whitestem pondweed *Potamogeton praelongus*. These lakes provide angling, boating and other recreational opportunities to their residents and non-resident users who access the lakes through an IDNR public launch located on Lime Lake. To help improve and protect water quality in these lakes this work addresses the feasibility of restoring habitat in the Concorde Creek drainage, the main tributary feeding Lime Lake and Lake Gage. Three sites were selected where opportunities for restoration exist. Two existing wetlands along the steam corridor on either side of C.R. 550W, the east and west wetland areas, provide opportunity for restoration. This can be accomplished through the installation of a single control structure at a preexisting railroad bed that bisects the wetland basin and Concorde Creek stream corridor west of C.R. 550W. Setting a pool level at the 971 foot elevation in this wetland system can defeat prior artificial channelization of Concorde Creek at this location and create approximately 6.6 acres of emergent and open water wetland on current disturbed areas dominated by low value invasive vegetation. Coupled with native plantings and active plant management this manipulation can have benefits for water quality in Lake Gage and Lime Lake by enhancing the removal of phosphorus, the primary nutrient responsible for water resource degradation. Benefits are likely to be derived from both a net retention of phosphorus within the wetland and a buffering of phosphorus loading from the Concorde Creek drainage though spring and summer vegetative phosphorus uptake within the wetland project areas. The east and west project areas are under two ownerships. Both landowners have been informed of the nature of the project and are thus far receptive. A second project area is located in a forested area just east of Lake Gage. Severe bank erosion is occurring in approximately 300 feet of the Concorde Creek stream corridor in this area. This stretch of stream is apparently an artificial channelization constructed to bypass a millpond basin that was impounded using the streams former natural course as a basin. This basin is now dry and 100% of Concorde Creek's flows travel though the eroding bypass channel.

We propose to restore the stream to a more stable morphology in the area of its former path increasing the length of travel and eliminating the severe erosion currently contributing eroded nutrients and sediments to Lake Gage and Lime Lake. Stream benthic macroinvertebrates were collected from three locations using EPA rapid bioassessment protocol II within and downstream of the project areas to provide comparative data with post project monitoring to assess habitat and biological community changes. These sites were also scored using the Qualitative Habitat Evaluation Index to provide qualitative data for comparison with post project scoring. Submersed aquatic plant community data was collected from the Lake Gage plantbed at the Concorde Creek delta to provide baseline data for possible species shifts in response to post-project water quality or sedimentation changes.

Part 2

Blue Heron Ministries, Inc. performed a wetland delineation and a wetland floristic and wetland assessment to: a) identify and approximately locate the boundaries of existing on-site wetlands; b) determine baseline quality of existing on-site wetlands; and c) assess the benefit of the proposed engineering project to the function and quality of the existing on-site wetlands.

The wetland delineation was conducted on private property (with landowner permission) as part of a wetland functional assessment for the Lake Gage-Lime Lake L.A.R.E. Engineering Feasibility Study. Field-work for the study occurred on May 18 and 20, 2005. The wetland investigation was conducted according to technical guidelines set forth in the 1987 Corps of Engineers Wetlands Delineation Manual (Technical Report Y-87-1).

Three distinct areas within the study area were determined to be wetlands according to the 1987 Manual. Beginning upstream the three areas include: a large wetland complex consisting of the main creek channel, associated emergent flats, and large fen lobes (Section IA, IB, and IC); a creekside vegetated bar (Section II); and the former millpond and former creek channel (Section III).

A total of approximately 59 acres of wetland was delineated on site for purposes of determining Army Corps of Engineers jurisdiction per Section 404 of the Clean Water Act. Upon field investigation Corps of Engineers field staff, Steve Sprecher, on January 28, 2005, it was determined that all the wetland sections may be considered "adjacent wetlands". Adjacent wetlands are wetlands that due to their proximity to a navigable water of the United States fall under the jurisdiction of the U.S. Army Corps of Engineers.

Jurisdiction of Waters of the United States, including wetlands, by the Army Corps of Engineers carries with it constraints to the development procedure. These constraints are in the form of permits required to perform certain activities within the delineated, jurisdictional wetlands. Development impacts to the jurisdictional wetlands of over 1.0 acre require that the owner apply for and obtain an Individual Permit for the fill activity. Developmental impacts of between 1.0 acre and 0.1 acre require that the owner apply for and receive a General Regional Permit for new construction activities. This permit requires the owner to provide compensatory wetland mitigation to replace the loss of wetlands and Waters of the U.S. Developmental impacts of less than 0.1 acres require no notification to the Army Corps of Engineers. All developmental impacts of any size require notification of the Indiana Department of Environmental Management and the Indiana Department of Natural Resources. Notification to the Indiana Department of Environmental Management may require the owner to apply for and receive a Section 401 permit along with compensatory wetland mitigation.

With regards to wetland quality and potential project impacts, Blue Heron Ministries, Inc. was charged with the task of a) collecting field data in regards to the flora of the wetland ecosystem; b) assessing the floristic quality of the areas in question; and c) offering an opinion as to the "type(s)" of wetland ecosystem(s) found on site.

A time-meander search was performed on each of the three delineated wetland areas on May 18 and May 20, 2005. Native and non-native herbaceous and woody plants were observed; identified to species, where practical; and names recorded for each of the three areas.

For each wetland area, data were cataloged and a "Floristic Quality Assessment" was performed according to Swink and Wilhelm (1995) and adapted by the Indiana Department of Environmental Management (IDEM). The evaluation checklist for the species encountered is "Floristic Quality Assessment for Plant Communities of Indiana: Species List and Coefficients of Conservatism" by IDEM (2004).

Based upon data collection and analysis, site observations, professional judgment, and comparisons with the Floristic Quality Assessment, portions of Wetland Section I (namely the upper reaches of Wetland Sections IA and IC) are worthy of classification as high quality natural areas. With a mean Coefficient of Conservatism value of 5.1 and 4.7, respectively and a Floristic Quality Index of 35.5 and 30.8, respectively the two areas are worthy of "high quality natural area" classification.

In addition, each area was assessed as to its potential classification as a Tier II wetland per "Draft Rule #99-58" under Title 327 of the Water Pollution Control Board (WPCB). In Indiana, a wetland is classified as a Tier I or Tier II type wetland (327 IAC 2-1.8.4). Wetlands are classified as Tier I or Tier II based upon the wetland's sensitivity to disturbance, rarity, and potential to be adequately replaced by compensatory mitigation. Tier II wetlands are acid bogs, circumneutral bogs, cypress swamps, fens, dune and swale, muck flat, sinkhole pond, sinkhole swamp, sand flat, and marl beach. Tier II wetlands are considered of high natural and environmental value.

Based upon the uniqueness of these natural features, familiarity with this type of landscape type, professional judgment, and comparison with the draft wetland classification system, portions of the wetland complex would be classified as a Tier II wetland. In particular, the upper reaches of the lobes of Wetland Section IA and IC would be classified as a "fen". According to the classification system, fens are considered Tier II wetlands.

Impacts to the upper reaches of Wetland Sections IA and IC should be avoided when considering constructed engineering options to improve water quality within the watershed of Lake Gage and Lime Lake. Placement of fill material or alteration of the wetland hydrology (including placement of additional water upon the wetland surface) would negatively impact the high quality nature of the upper reaches of Wetland Sections IA and IC. Any proposed water control structures intended to raise water levels in the Wetland Section I should be sized so as not to flood the fen areas associated with the upper lobes of that Section.

It is further recommended that any proposed flooding of the degraded portions of Wetland Section I be preceded by vegetative control measures. The control measures should be aimed at removing the exotic and invasive Reed Canary Grass (*Phalaris arundinacea*) and Common Reed (*Phragmites australis*). Removal of these species would help reduce the risk of spread into the higher quality fen areas which would likely occur as a result of hydrology manipulation.

Based upon the degraded quality of the near-stream portions of Wetland Section I, the proposed activity of impounding water on the site would not have an adverse impact upon the wetland plant community. By contrast, eradication of invasive species and planting of native, submerged and emergent aquatic vegetation would increase the diversity of the wetland plant community.

Based upon the low quality and nature of the former millpond wetland plant community in Wetland Section III, the proposed activity of restoring the stream meander would potentially improve the quality of the wetland area. Planting shade tolerant, streamside emergent wetland vegetation as part of the restoration project would enhance the quality of the wetland plant community. The loss of a minimum number of tree species located in the former stream channel would be mitigated by improved hydrologic flow, increased vegetative diversity and improved wetland function and habitat.

Overall, the proposed engineering project would enhance existing wetland function and habitat by preserving high quality natural areas, improving existing wetland vegetation diversity, and diversifying wetland hydrology.

Part 3

A natural watercourse flows generally west from Crooked Lake (elevation 989 MSL) approximately 1.4 miles to the southeast end of Lake Gage (elevation 954 MSL). The natural watercourse flows through areas of natural wetland. The stream channel was excavated and straightened and no longer meanders through the wetland areas. The construction of an in channel water control structure and baffles could re-establish stream flow through natural wetland areas.

A water control structure constructed in the gap of the abandoned railroad grade could re-establish water levels in the west and east wetland areas. Existing ground elevation in the west wetland area generally ranges from 969.5 MSL to 971.0 MSL and ground elevations east of C.R. 550W generally range from 970.0 MSL to 973.0 MSL. A water control structure which establishes a normal pool elevation of 971.0 MSL would flood an area of 1.4 acres in the west wetland area between the abandoned railroad and C.R. 550W. The same structure would flood an area of approximately 4.4 acres in the east wetland area east of C.R. 550W.

The Indiana Department of Natural Resources Division of Water provided a 100 year flood flow of 100 cubic feet per second (cfs). The water control structure should be designed to pass the 100 cfs flow without causing flood pool elevations in the wetland from exceeding 972.5 MSL. A flood pool elevation of 972.5 MSL would not reach the yard of a residence located north of the west wetland area. A flood pool elevation of 972.5 MSL would cover a surface area of 3.0 acres in the west wetland area and 18.0 acres in the east wetland area.

A dam was constructed across the stream channel approximately 500 feet upstream from Lake Gage. The dam formed a millpond for a sawmill. The dam and concrete water control structure remain in place. What appears to be a secondary dam for additional water storage was constructed 350 feet upstream from the millpond dam. A ditch was excavated through wooded uplands from the natural stream channel above the secondary dam to Lake Gage. The excavated ditch by passes the millpond and historic natural stream channel. The excavated ditch is 400 feet in length, approximately 7 feet deep and relatively straight with steep side slopes. The ditch bottom is approximately 12 feet wide. The steep ditch banks are not well vegetated due to the woodland location and channel erosion is a problem. Soils eroded from the ditch banks are deposited in Lake Gage.

The restoration of the historic natural stream channel and the abandonment of the excavated ditch would resolve the problem of ditch bank erosion. Stream restoration would result in a wide meandering channel with opportunities for natural erosion control, limited flow could be provided to the abandoned excavated ditch channel.

STATEMENT OF PROJECT PURPOSE

This work was designed to investigate the feasibility of utilizing streambed and wetland restorations in the Concorde Creek drainage to improve the overall quality of tributary waters flowing into Lake Gage and Lime Lake. Direction and conceptual design is provided to the Lake Gage and Lime Lake Association, Inc. and the Indiana Department of Natural Resources with an emphasis on the potential for completing the restoration of previously modified stream channel reaches and defeating prior attempts at wetland drainage in the Concorde Creek watershed. The recommended project scope includes modifications to provide relevant benefit to Lime Lake and Lake Gage in terms of water quality while having a high likelihood of complying with necessary regulatory permit requirements and producing minimal physical, financial, and social costs. Project parameters were also designed to consider potential positive and negative effects on aquatic and terrestrial wildlife and provide for the restoration of highly disturbed wetland plant communities and unstable stream morphology. The recommended project scope seeks to provide Concorde Creek with stable habitat that more closely mimics the historical native structure and function of these areas.

At 327 and 57 acres respectively Lake Gage and Lime Lake in Steuben County are valuable aquatic resources the lake's residents, users, and the state of Indiana. Lake Gage is one of only 13 northern Indiana lakes known to presently contain Cisco *Coregonus artedi,* one of only two fish species listed as a species of special concern in Indiana waters. This species of lake whitefish is thought to have occurred naturally since 1955 in at least 46 Indiana lakes (Frey 1955). The decline in cisco in Indiana lakes during the 20th century is thought to be a response to habitat changes caused by nutrient enrichment. IDNR fisheries managers have maintained an active program to update the population status of the cisco and work toward the preservation of the species. Targeted gill-net surveys and collection of water quality data are currently used to assess cisco population status at various lakes. Lake Gage remains the largest Indiana lake where these fish are still listed by IDNR as "common". IDNR Catch-per-unit effort figures however, have shown declining catches through the three sampling efforts (1973, 1975, and 1991). Because of the existence of coldwater fisheries habitat in Lake Gage it also receives yearly plantings of approximately 3000 rainbow trout by IDNR and is a popular trout fishery for local residents. To protect water quality at Lake Gage and adjacent connected Lime Lake ways are being sought to reduce nutrient loading to the lakes. Examination of the Concorde Creek drainage, the primary tributary which flows into the east end of Lake Gage, reveals the remnants of an adjoining ditch running through one of the wetlands draining to the creek and two artificially channelized sections of stream. Artificial channelization and ditching at C.R. 550W (east and west wetland areas) have reduced the function of wetland in this area. Additionally, areas in this wetland that are subject to repeated flooding and draining in response to changes in flow have developed degraded plant communities dominated by Reed Canary Grass *Philaris arundenacia* a non-native invasive species with little value in terms of wildlife habitat and water quality. Utilization of an abandoned railroad right-of-way as a point for installation of a water control structure can allow for stabilization of water levels in the wetlands and defeat the effects of prior attempts at drainage. Coupled with active management and the planting of a more beneficial native plant community this can help increase the value of this wetland area with regard to the filtering of nutrient loads to Lake Gage and Lime Lake. In the lower portion of the Concorde Creek drainway a channelized section of stream shows severe erosion. Restoration of the stream to a prior course that recreates historic stream morphology can eliminate sediment and nutrient contributions to the lakes from the current eroding section.

1 Identification of potential construction sites

1.1 With the primary goal of protecting and improving long-term water quality in Lake Gage and Lime Lake, sites were sought for the provision of attenuation of nutrient and sediment loads in inflowing waters of Concorde Creek and prevention of erosion along the streamcourse between Crooked Lake and Lake Gage. Efforts at attenuation of watershed non-point source pollutants focused on sites where lake-bound flows could be retained in wetland systems to provide for settling of nutrient containing particulates and vegetative uptake of dissolved phosphorus. Erosion control efforts focused on prevention and repair of severe bank erosion occurring on the lower stretch of Concorde Creek just east of Lake Gage.

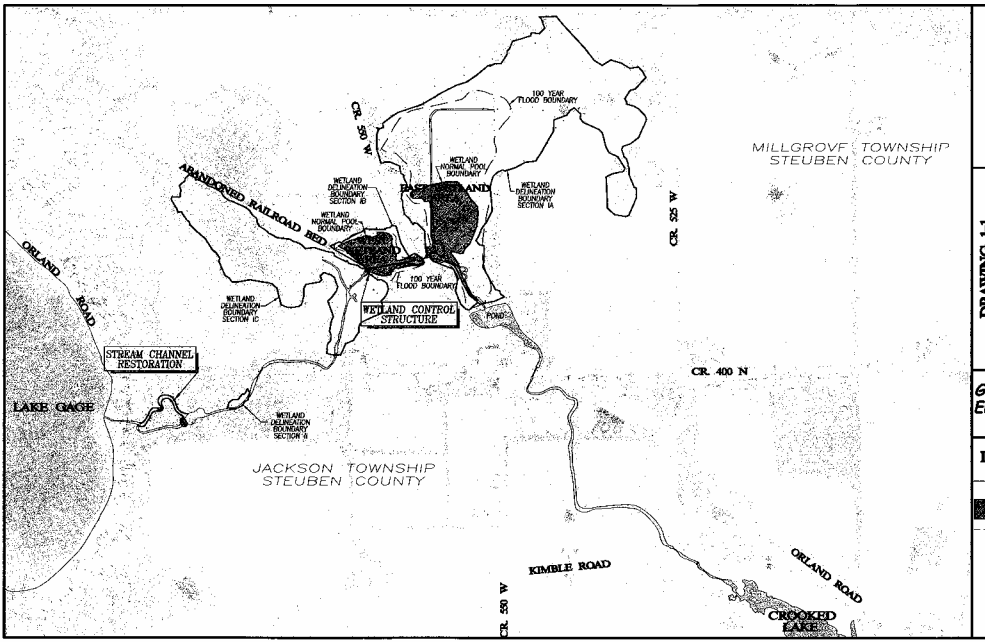
Prior to this work, site selection had been narrowed to four possible project areas. The culvert beneath C.R. 550W was considered as a possible location for a control structure to regulate water levels in the wetland basin east of C.R. 550W. An abandoned railroad grade that crosses the same wetland system downstream of C.R. 550W was also considered as a possible sight for water level control. A third possible sight was located downstream between the railroad grade and Orland Rd. A fourth site considered for a possible flooding and wetland construction included a preexisting abandoned sawmill pond adjacent to Concorde Creek in a forested area just east of Lake Gage. This site could also serve the purpose of bypassing the existing eroding stream channel via rerouting Concorde Creek through the millpond basin.

1.2 To avoid inundating preexisting areas of high quality native wetland plant communities within the wetland restoration project areas a target water level elevation of 971 feet was established. It was determined that this level would inundate primarily lower-quality habitat areas dominated by Reed Canary Grass while likely still providing benefits to stream water quality and the lakes. It was determined that an impoundment of this water level could be attained with the use of a single control structure located at the abandoned railroad bed, effectively manipulating hydrology in both the east and west wetland area.

1.3 The area just north of Orland Rd. was eliminated as a potential project site when the landowners declined to show interest in the project. Water level manipulation in this area would have also required the fill of a significant area of wetland to create an earthen dike and would not likely meet with regulatory permitting requirements.

1.4 In terms of providing a site for a constructed wetland, the use of the millpond in the forested area east of Lake Gage offered the advantage of close proximity to Lake Gage. This system would be attenuating waters from the entire Concorde Creek watershed. A presumably man-made bypass channel currently carries all the Concorde Creek flow around the abandoned basin. Reestablishment of the stream flow through the old pond basin and refilling of the basin would required the removal of a short section of earthen dike and the use of a water-level control structure in the preexisting dike. This would also take flows around the constructed section of bypass channel which has eroded and undercut badly providing a source of soil pollutants to Lake Gage and Lime Lake. To establish desirable diverse wetland vegetation in this area to make the best use of the millpond basin it would be best to remove several large trees in the millpond basin to provide light. Concerns by the property owner over the loss of significant timber in this scenario eliminated the potential for long-term impoundment of stream waters at

this location. Outside utilization of the millpond as a constructed wetland, alternatives for repairing the severe streambank erosion in this area included relocation of the streambed to the millpond basin to bypass the eroded stretch, or removal of soil to the angle of repose and reshaping/stabilization of the eroded streambanks. Reconstruction of the current streambanks in the eroded section was eliminated as an option due to significant timber removal being necessary. Further examination of the area and the current stream morphology revealed that the streamcourse likely meandered through the area of the millpond basin prior to construction and impoundment of the millpond so relocation of the stream to a more natural and stable channel through the millpond basin was pursued as the best course of action.


100 YEAR FLOOD BOUNDARY
CR. 550 W
MILLGROVE TOWNSHIP
STEUBEN COUNTY
CR. 525 W
ABANDONED RAILROAD BED
WETLAND DELINEATION BOUNDARY SECTION 1B
WETLAND NORMAL POOL BOUNDARY
WETLAND NORMAL POOL BOUNDARY
BASIN LAND
WETLAND DELINEATION BOUNDARY SECTION 1A
100 YEAR FLOOD BOUNDARY
WETLAND CONTROL STRUCTURE
WETLAND DELINEATION BOUNDARY SECTION 1C
ROAD
ORLAND ROAD
STREAM CHANNEL RESTORATION
CR. 400 N
LAKE GAGE
WETLAND DELINEATION BOUNDARY SECTION 1A
JACKSON TOWNSHIP
STEUBEN COUNTY
KIMBLE ROAD
CR. 550 W
ORLAND ROAD
CROOKED LAKE
0 250 500
Scale 1" = 500'
DRAWING 1-1
CROOKED LAKE OUTLET STREAM MASTER PLAN
LAKE GAGE AND LIME LAKE ENGINEERING FEASIBILITY STUDY
Gensic Engineering Inc
Civil Engineers
LEGEND
WETLAND DELINEATION BOUNDARY
WETLAND NORMAL POOL BOUNDARY
WETLAND 100 YEAR FLOOD BOUNDARY

2 Preliminary Engineering

2A Wetland Water Control Structure

2A.1 Introduction

The natural watercourse from Crooked Lake to Lake Gage flows through areas of natural wetland. The stream channel was excavated and straightened and no longer meanders through the wetland areas. The construction of an in channel water control structure and baffles could re-establish stream flow through natural wetland areas.

The stream flows from the Crooked Lake water control structure through a culvert crossing at Kimble Road. The stream continues northwesterly through an agricultural field to a culvert at Orland Road and through concrete bridge abutments at an abandoned railroad grade. The stream continues through a private pond northeast of Orland Road and C.R. 550W. The pond water control structure discharges to a large natural wetland east of C.R. 550W (east wetland area).

The stream channel continues northwesterly through the southwest corner of the wetland area to C.R. 550W and crosses to a wetland basin between C.R. 550W and the abandoned railroad grade (west wetland area). The stream channel is straight and well defined in the west wetland area. The channel continues westerly through a gap in the abandoned railroad grade and through a wetland basin to Orland Road. The stream continues south of Orland Road flowing in a meandering westerly direction to the excavated ditch which discharges into Lake Gage. During normal flows the surface elevation of the stream is below the wetland ground elevation. The excavated stream channel acts as a drain to the natural wetland areas.

2A.2 Water Control Structure Location And Preliminary Design

A water control structure constructed in the gap of the abandoned railroad grade could re-establish water levels in the west and east wetland areas. Existing ground elevation in the west wetland area generally ranges from 969.5 MSL to 971.0 MSL and ground elevations east of C.R. 550W generally range from 970.0 MSL to 973.0 MSL. A water control structure which establishes a normal pool elevation of 971.0 MSL would flood an area of 1.4 acres in the west wetland area between the abandoned railroad and C.R. 550W. The same structure would flood an area of approximately 4.4 acres in the east wetland area east of C.R. 550W.

Early coordination comments from the United States Fish and Wildlife Service recommend that the water control structure should be designed to allow for the passage of amphibians. Preventing the passage of carp may also be desirable. Other design criteria requirements may surface during the engineering design and permitting process.

The most economical and maintenance free water control structure may be a sheet piling weir with a reno basket spillway. A separate stop log box and pipe water control structure for drawing down wetland water level could be constructed adjacent to the weir.

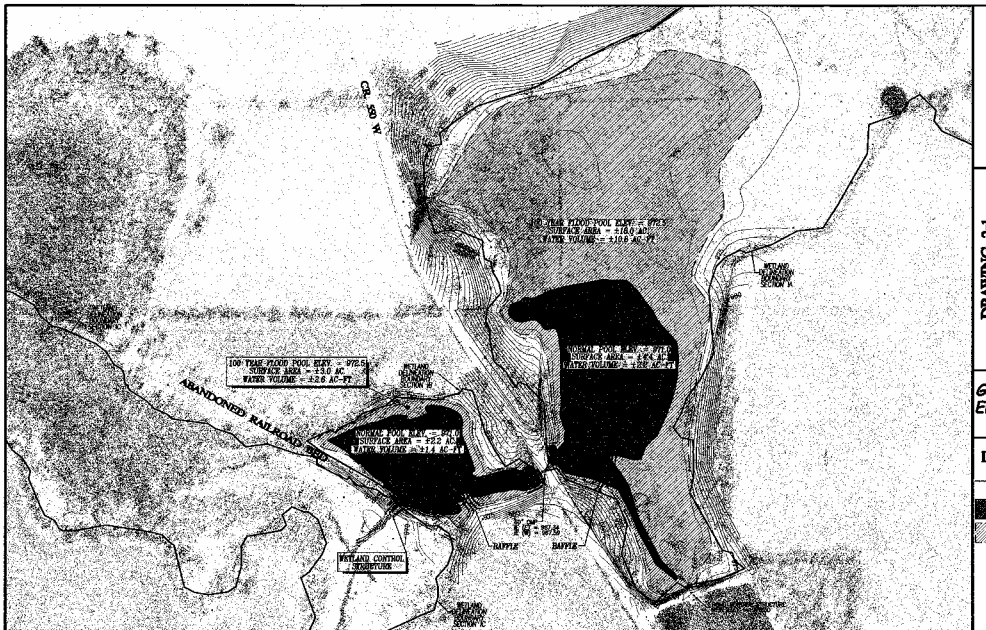
The railroad grade should be sloped to provide easy access to the water control structure for inspection and maintenance.

In stream baffles should be constructed in the channel at the upper end of the east and of the west wetland area. The baffles would help direct water flows into the wetlands and deter flows from following the existing channel and short circuiting through the wetland.

2A.3 Permits

Permits likely required for the wetland water control structure include but may not be limited to:

- United States Army Corps of Engineers Wetland Permit
- Indiana Department of Natural Resources Division of Water Permit for construction within a floodway of a stream
- Indiana Department of Environmental Management Rule 5 Erosion Control Permit



0 100 200
Scale 1" = 200'

DRAWING 2-1

WETLAND AREA PLAN

LAKE CHASE AND LIME LAKE
ENGINEERING FEASIBILITY STUDY

Gensic Engineering Inc
Civil Engineers

LEGEND

- WETLAND DELINEATION BOUNDARY
- WETLAND NORMAL POOL BOUNDARY
- WETLAND 100 YEAR FLOOD BOUNDARY

2B Stream Channel Restoration

2B.1 Introduction

A natural watercourse flows generally west from Crooked Lake (elevation 989 MSL) approximately 1.4 miles to the southeast end of Lake Gage (elevation 954 MSL). A dam was constructed across the stream channel approximately 500 feet upstream from Lake Gage. The dam formed a millpond for a sawmill. The dam and concrete water control structure remain in place. What appears to be a secondary dam for additional water storage was constructed 350 feet upstream from the millpond dam. A ditch was excavated through wooded uplands from the natural stream channel above the secondary dam to Lake Gage. The excavated ditch by passes the millpond and historic natural stream channel.

The natural stream channel above the excavated ditch varies from 15 feet to over 30 feet wide and meanders through wetland flats between high banks. There appears to be no bank erosion along the natural stream channel. There may have been a wetland delta at the mouth of the natural stream, but it appears that wetlands were filled for lakeshore development.

2B.2 Ditch Channel Erosion

The excavated ditch is 400 feet in length, approximately 7 feet deep and relatively straight with steep side slopes. The ditch bottom is approximately 12 feet wide.

The steep ditch banks are not well vegetated due to the woodland location and channel erosion is a problem. Soils eroded from the ditch banks are deposited in Lake Gage.

2B.3 Ditch Channel Erosion Control

The ditch is located on private property and the owner is concerned with the possible loss of trees resulting from an erosion control project. The property is also a natural hardwood forest and the goal of any project should be to retain a natural appearance.

Solutions to the ditch bank erosion problem that were considered and dismissed included: replacing the ditch with 400 feet of pipe, lining the ditch channel with gabions, or excavating ditch banks to flatten slopes. These solutions would involve clearing upland trees and would change the natural character of the property. The above ditch bank erosion control projects would probably not be permitted by the property owner.

2B.4 Natural Stream Channel Restoration General Description

The restoration of the historic natural stream channel and the abandonment of the excavated ditch would resolve the problem of ditch bank erosion. Stream restoration would result in a wide meandering channel with opportunities for natural erosion control, limited flow could be provided to the abandoned excavated ditch channel.

The historic stream channel is a meander that varies from 40 to 60 feet in width. The channel contains 6 to 12 inches of sediment above gravel in the millpond basin. Down stream from the millpond dam is a reach of proposed channel restoration where sediments are approximately 30 inches deep above gravel. This segment is approximately 100 feet in length. The historic stream

channel may have been diverted and filled for development and this sediment deposit may be a remnant of a stream delta wetland. This area would be the final reach of stream restoration and could be excavated as a shallow sediment basin for trapping sand migrating along the stream bottom. This pool would discharge to the channel which flows between the cottages along Lake Gage.

It would be beneficial to remove obstructions from the channel between the cottages and line the banks with native stones. Residents have also expressed concerns regarding the capacity of the road culvert. The road culvert could be replaced by the Steuben County Highway Department.

The stream channel restoration would generally consist of removing portions of the secondary dam and millpond dam and diverting the stream to the historic channel. The project would include limited tree removal, sediment excavation in the restored channel bottom, excavation of dams, erosion control, and vegetative plantings.

2B.5 Existing Topography

The area from Lake Gage to the secondary dam, the proposed beginning point for stream channel restoration, was surveyed. Mean sea level (MSL) elevations were established to determine the feasibility of the stream restoration project. The channel elevation at Lake Gage is 953.8 MSL and the channel elevation above the secondary dam where stream channel restoration would begin is 961.4 MSL. The existing channel elevation at the downstream end of the proposed restoration area is 956.5 MSL. The gradient of the 400 feet length of excavated ditch which is proposed to be abandoned is approximately 1.2 percent. The elevation of the historic stream channel 100 feet downstream from the point of beginning for stream channel restoration is 957.2 the restored stream channel would have a gradient of approximately 4.2 percent for 100 feet in the area where the secondary dam would be removed. The remaining 500 feet of stream restoration would have a channel gradient of approximately 0.14 percent. In general the stream gradient could be reduced by restoring the historic channel.

2B.6 Clearing

Tree removal is a concern and stream channel restoration activities should be performed with minimal disturbance to the adjacent natural area. Construction access or haul roads should be limited and meticulously restored to natural conditions. Trees slated for removal are generally not very large and are not high quality hardwoods.

Table 2-1
Stream Channel Restoration
Tree Removal

Sediment Disposal Area (Quarry)

- 1 - 9" green ash
- 1- 10" green ash
- 1 - 8" cherry
- 1 - 3" elm

Secondary Dam

- 1 - 18" Mulberry (split trunk and bent over)

Millpond Area

3 - 4" elms
2 - 5" elms
1 - 6" elms
1 - 13" cottonwood

Millpond Dam

1 - 9" red oak
1 - 5" mulberry
2- 5" hornbeams
1 - 8" green ash

Downstream from Millpond Dam

1 - 8" cottonwood
2 - 11" elms
1 - 7" green ash
1 - 5" hornbeam

Trees would only be removed from the channel where sediment is excavated and removed trees would be used for erosion control and structure in the restored stream.

2B.7 Excavation

Excavation will be required to remove portions of the secondary dam and mill pond dam. Excavation will also be required to establish the restored stream channel. Sediment should be excavated from the channel to prevent erosion and transportation to Lake Gage. Excavation and erosion control should be performed prior to diverting stream flow from the excavated ditch. The secondary dam should be removed as the final stage of construction. Excavation from the dam could be used to plug the excavated ditch and divert flow to the restored channel. A small pipe through the plug would provide minimal flow to the ditch.

If permitted excavated sediment could be hauled to the quarry adjacent to the stream restoration. If not , excavated sediment should be hauled off the site, at greater expense.

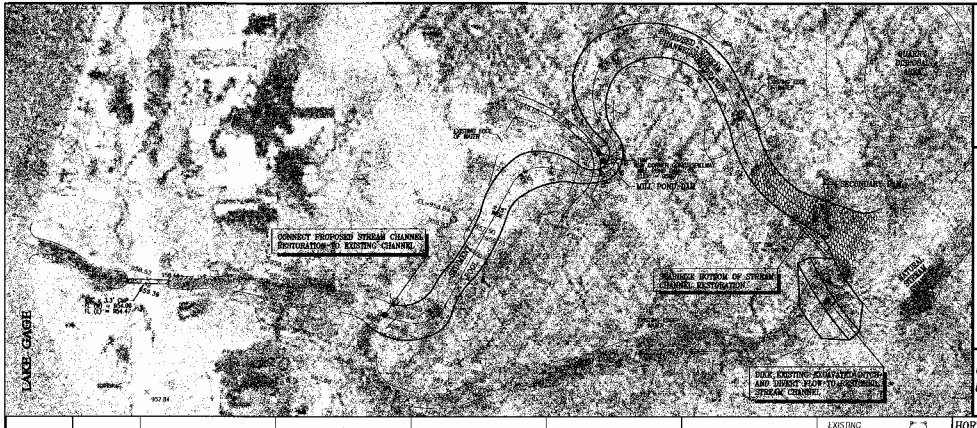
2B.8 Erosion Control

Extensive stream bank erosion control should be constructed to prevent remaining millpond and wetland sediments from being transported to Lake Gage. Removed trees, existing downed timber, bio-logs, and native stone could provide stream bank protection and structure in the restored channel. Special care should be taken in design and construction to prevent sediments in the natural stream channel above the secondary dam from being eroded and transported to Lake Gage. Areas disturbed by construction should be restored and plantings should be consistent with existing vegetation.

2B.9 Permits

Permits likely required for stream channel restoration include but may not be limited to:

- United States Army Corps of Engineers Wetland Permit
- Indiana Department of Natural Resources Division of Water Permit for construction within a floodway of a stream
- Indiana Department of Environmental Management Rule 5 Erosion Control Permit

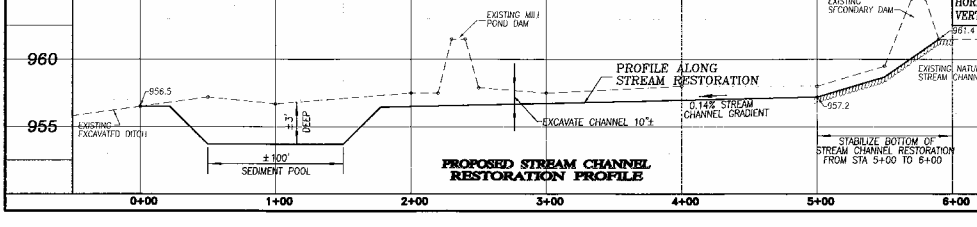


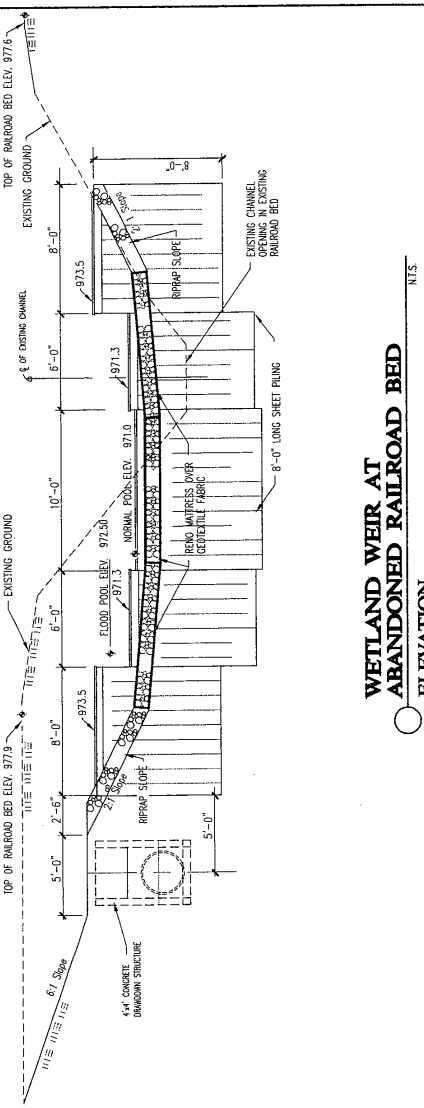
DRAWING 2-2

MILL POND STREAM CHANNEL RESTORATION PLAN AND PROFILE

LAKE GAGE AND LIME LAKE ENGINEERING FEASIBILITY STUDY

Gensic Engineering Inc
Civil Engineers





WETLAND WEIR AT ABANDONED RAILROAD BED

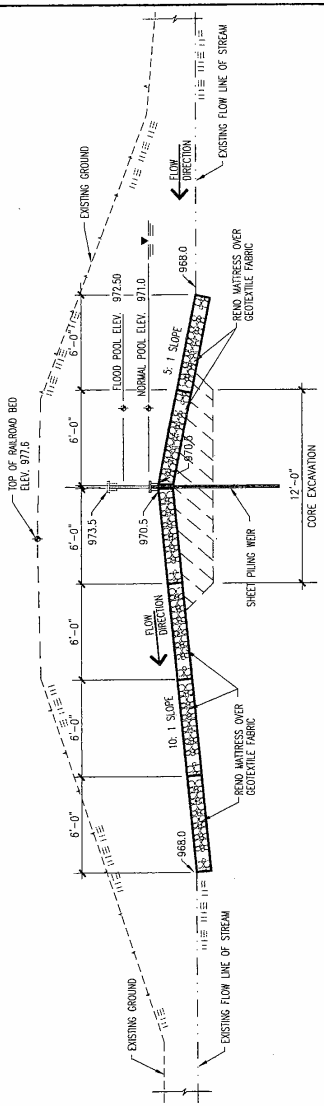
ELEVATION

N.T.S.

DRAWING 3-1

CROOKED LAKE OUTLET STREAM

WEIR ELEVATION AT ABANDONED RAILROAD BED



WETLAND WEIR AT ABANDONED RAILROAD BED

TYPICAL CROSS SECTION N.T.S.

DRAWING 3-2

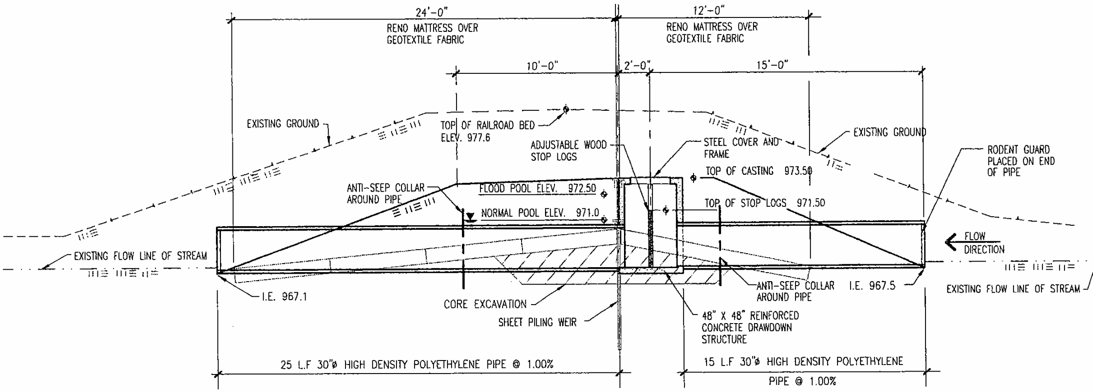
CROOKED LAKE OUTLET STREAM

WEIR CROSS SECTION AT ABANDONED RAILROAD BED

DRAWING 3-3

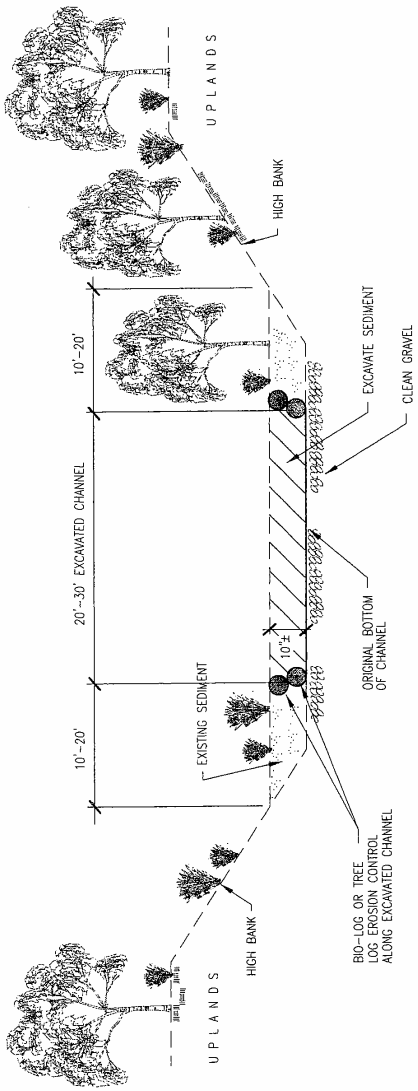
CROOKED LAKE OUTLET STREAM

WETLAND DRAW-DOWN STRUCTURE
AT ABANDONED RAILROAD BED



WETLAND DRAW-DOWN STRUCTURE AT ABANDONED RAILROAD BED

TYPICAL PROFILE N.T.S.



STREAM CHANNEL EXCAVATION N.T.S.

TYPICAL CROSS SECTION
STATION 0+00 TO 6+00
(EXCEPT SEDIMENT POOL, MILL POND DAM, AND SECONDARY DAM EXCAVATION AREAS)

DRAWING 3-4

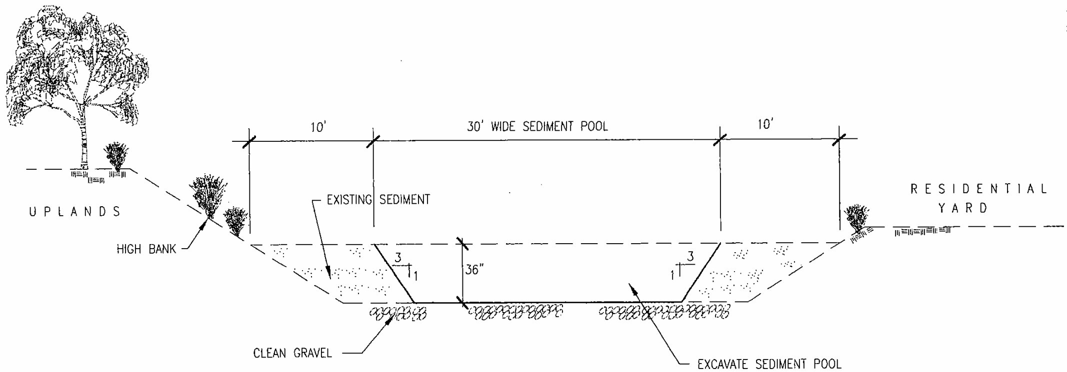
MILL POND STREAM CHANNEL RESTORATION

STREAM CHANNEL EXCAVATION

DRAWING 3-5

MILL POND STREAM CHANNEL RESTORATION

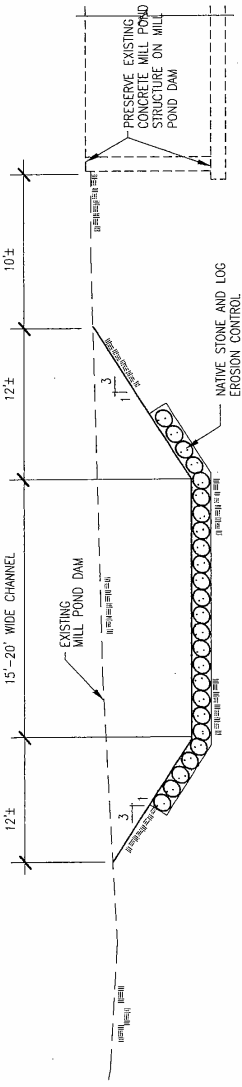
SEDIMENT POOL



SEDIMENT POOL

N.T.S.

TYPICAL CROSS SECTION
STATION 0+75



STREAM CHANNEL EXCAVATION AT MILL POND DAM

TYPICAL CROSS SECTION
STATION 2+25

N.T.S.

DRAWING 3-6

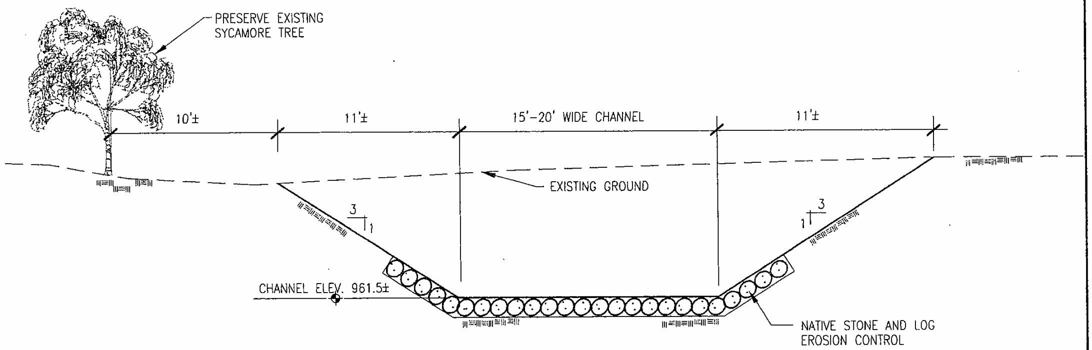
MILL POND STREAM CHANNEL RESTORATION

STREAM CHANNEL EXCAVATION AT MILL POND DAM

DRAWING 3-7

MILL POND STREAM CHANNEL RESTORATION

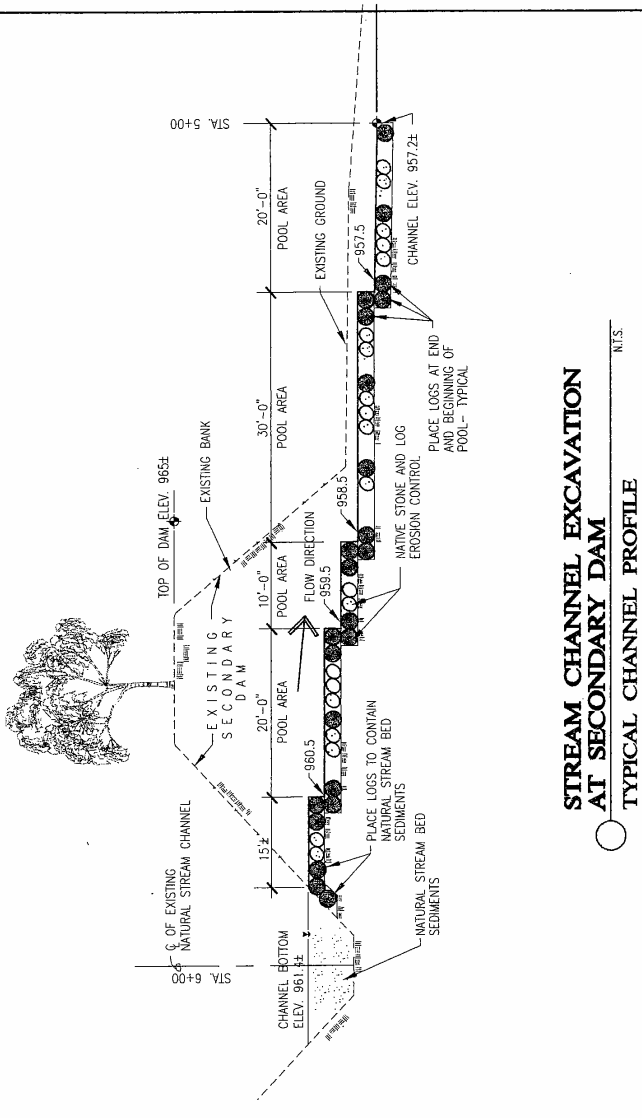
STREAM CHANNEL EXCAVATION
AT SECONDARY DAM



STREAM CHANNEL EXCAVATION
AT SECONDARY DAM

N.T.S.

TYPICAL CROSS SECTION
STATION 5+75



STREAM CHANNEL EXCAVATION AT SECONDARY DAM

TYPICAL CHANNEL PROFILE
STATION 5+00 TO 6+00

N.T.S.

DRAWING 3-8

MILL POND STREAM CHANNEL RESTORATION

STREAM CHANNEL PROFILE AT SECONDARY DAM

4 Preliminary Design and Construction Cost Estimates

4A Wetland Water Control Structure

4A.1 Basic Opinion of Construction Cost

1. Mobilization and demobilization	$2,000.00
2. Excavation for water control structure	$4,400.00
3. Sheet piling weir	$6,600.00
4. Geotextile fabric	$300.00
5. Reno mattress 9' X 6' X 9" with stone	$6,000.00
6. Wetland drawdown structure	$3,100.00
7. In stream baffles	$4,400.00
8. Restoration and plantings at structure and baffles	$2,000.00
Basic Opinion of Construction Cost	$28,800.00

4A.2 Basic Opinion of Plantings Cost

1. Eradication of phragmites and reed canary grass	$4,000.00
2. Plant submersed aquatic plantings	$2,500.00
3. Plant emergent aquatic plantings	$6,000.00
4. Plant wetland edge seeding	$6,000.00
Basic Opinion of and Planting Cost	$18,500.00

Wetland Water Control Structure
Total opinion of construction and planting cost $47,300.00

4B Stream Channel Restoration Opinion of Cost

4B.1 Basic Opinion of Construction Cost

1. Mobilization and demobilization	$2,000.00
2. Clearing	$1,500.00
3. Excavation	$17,000.00
4. Log erosion control	$1,500.00
5. Rock erosion control @ dam excavations	$6,000.00
6. Pipe through ditch plug	$600.00
7. Plantings	$5,000.00
8. Rock channel bank erosion control	$11,000.00
Basic Opinion of Construction Cost	$44,600.00

4B.2 Alternate 1 Opinion of Construction Cost

With Bio-log Channel Bank Erosion Control

Basic Opinion of Construction Cost	$44,600.00
Deduct Item 8 Rock	- $11,000.00
Add 1000 lft Bio-log	+ $50,000.00
Alternate 1 Opinion of Construction Cost	$83,600.00

Wetland Water Control Structure and Stream Channel Restoration
Total Opinion of Construction Cost $91,900.00 - $130,900.00

4C LARE Engineering Design Phase

4C.1 Opinion of Cost for LARE Engineering Design Phase for wetland water control structure and stream channel restoration including: topographic survey, engineering design and plan drafting, preparation of bidding documents and public agency permitting
$32,000.00

4D Easements

4D.1 At this time the possibility of paying for land use easements was not addressed.

5 Project Timeline

5.1 Project Design

January 31, 2006 Deadline for Lake and River Enhancement (LARE) application for Design funding.
September, 2006 Award Design Phase to an engineer and begin design.
June, 2007 Complete design and permitting.

5.2 Project Construction

January 31, 2007 Deadline for LARE application for Construction Phase funding
October, 2007 Award construction contract to contractor.
Fall, 2007 Eradication of invasive species
Spring, 2008 Eradication of invasive species
August, 2008 Complete construction
Fall, 2008 Seeding, site conditions permitting
Spring, 2009 Aquatic planting, site conditions permitting

5.3 Completion Date Comments

Completion dates for engineering design and permitting are dependent on timely response and comments from public reviewing agencies. Construction completion dates are dependent on weather and water flows. The timeline for engineering presented above assumes that permits will be approved within five months of submittal. The timeline also assumes that LARE will allow submittal of the Construction Phase application prior to the approval of all permit applications.

6 Easements and Land Availability

6.1 East and West Wetland Areas

Establishing the proposed normal pool level in the east and west wetland areas will increase longterm water levels on approximately 6.6 acres of preexisting scrub/shrub and emergent wetland. This involves parcels in two ownerships with private ground lying at or below normal pool level. Initial contact with involved landowners in the wetland project areas began in the lake diagnostic study phase. Relevant information about the extent and nature of the project has been provided to the landowners in written correspondence or in person. At the time of this report draft, neither of the landowners involved have expressed objection to the project.

6.2 Stream Channel Restoration

The stream channel restoration area is under single ownership. Correspondence with the landowners began shortly after the lake diagnostic study project phase at Lake Gage and Lime Lake. The landowners have been provided all relevant information about the nature and extent of the project in person or in written correspondence and they have thus far been very receptive to the restoration.

6.3 Construction Equipment and Ecological Management Access, East and West Wetland Areas

Because the east wetland project area involves no construction activities no additional easements or landowner cooperation will be necessary. Plantings, herbicide applications, and other ecological management activities associated with the project can be performed by gaining access to the project area on the principal landowner's property with negligible impacts. Construction activities associated with the water-control structure in the west wetland project area are unlikely to require additional easements or landowner cooperation beyond the principal project landowner. Equipment access to the area of the water control structure should be done outside the growing season if access through the landowners cropped field adjacent to C.R. 550W is needed. Construction activities should also be timed to accommodate lease agreements between the principal landowners and deer hunters in and near the east and west wetland project areas.

6.4 Construction Equipment Access, Stream Channel Restoration

Construction activities associated with the stream channel restoration are unlikely to require additional easements or landowner cooperation beyond the principal project landowner. Access to the project site can be gained via the landowner's frontage on Orland Road.

7 Project Physical and Social Impacts

7.1 Aesthetics And Motor Vehicle Traffic In/Near Project Areas

The east and west wetland project areas are relatively remote, lying within existing scrub/shrub wetlands adjacent to a low-traffic unpaved road (C.R. 550N). The stream restoration area lies adjacent to Orland Road, a well traveled paved roadway but is within a heavily forested area and not visible to passersby when the trees are leaved. With the project areas relatively remote and largely outside public view, disruptions in motor traffic or area aesthetic qualities are expected to be minimal. The minor duration and extent of earthmoving activities associated with the projects is not expected to provide a serious hindrance to motor vehicle traffic on C.R. 550N or Orland Road. Views of the project areas from existing dwellings are limited to one residence belonging to a project property owner near the east wetland area. During the summer and early fall this view is obstructed by leaves/vegetation.

7.2 Recreation: East and West Wetland Areas

Principal wetland project area and adjacent landowners have lease agreements with recreational deer hunters and derive substantial income from hunting leases. Construction and management activities should be timed to avoid interference with these activities. Because the wetland restoration project is designed to change wetland hydrology and increase water depth it may cause a shift in the travel patterns of whitetail deer in and around the project area and slightly decrease the amount of bedding area present. Prime grass, sedge, and shrub bedding and forage areas located on transitional zones adjacent to the surrounding upland hardwood and crop areas near the project will be minimally impacted. The loss of vegetation suitable for whitetail deer forage in the pool area is expected to be minimal. Most of the pool area is currently dominated by invasive low-quality vegetation in terms of wildlife forage. The amount of habitat adversely affected in terms of area deer numbers or overall whitetail deer habitat is expected to be insignificant. Improvements in opportunities for bird watching, wildlife observation and photography, or recreational waterfowl harvest and furbearer trapping may be significant. An increased and more stable water level and the planting and management of beneficial native vegetation will increase wildlife habitat value in much of the project area. Use of the area for waterfowl breeding, loafing, and roosting habitat can be expected. Beaver, otter, mink, and muskrat are likely to inhabit the flooded area. Because the project site is currently scrub/shrub and emergent wetland and partially subject to inundation, opportunities for other forms of recreation will remain limited and largely unchanged with project completion.

7.3 Recreation: Stream Channel Restoration Area

Because trespassing and hunting are not permitted in the stream channel restoration area effects on recreational value are not expected to be significant. This heavily forested area is valuable in providing aesthetic appeal to adjacent landowners and passersby and will remain unaffected in that regard. Its use as a retreat and natural area for the property owners is expected to be improved with the restoration of a more stable and natural streamcourse.

7.4 Mosquito And Biting Fly Reproduction

Breeding of mosquitoes and biting flies is often associated with the creation of standing water and can cause concern for area residents. Because the stream flow originates at Crooked Lake and the stream and upstream pond contain several species of fish the proposed project areas are

not likely to significantly increase area mosquito production. Fish-bearing waters in general don't support a high yield of adult mosquitoes due to predation on the aquatic larval stage of the insects by young of the year and small adult fishes. Mosquito production is generally supported by isolated areas of temporary floods and rain water-holding debris. Seasonal flows in the project areas are typically more than sufficient to repopulate any pooled areas contiguous with the stream flow with native fishes should the wetland project area lose it's fish due to summertime anoxia.

7.5 Historical and Archaeological Aspects

Per correspondence February 9, 2005 Christie Kiefer of the IDNR Division of Water pursuant to Indiana Code 14-21-1-18 The Indiana Department of Natural Resources, Division of Historic Preservation and Archaeology conducted a review of materials related to the project and determined that no historic structures will be altered, demolished, or removed by the proposed project. An archaeological site (12-Sn-173) is recorded in the area of the west wetland restoration. It was determined that the archaeological site was not within the area expected to be impacted or inundated by the project so no further archaeological investigations or avoidance should be necessary with regard to the project.

7.6 Rare, Threatened, and Endangered Species

The Indiana Natural Heritage Database collects information on the occurrence of State and Federally listed Rare, Threatened, or Endangered species. Per Correspondence with the Indiana Department of Natural Resources the Natural Heritage Programs data have been checked and no rare, threatened, or endangered species are reported to occur in the project vicinity to date.

8 Flood Stage Analysis

8A Wetland Water Control Structure

8A.1 Design Flows

The Indiana Department of Natural Resources Division of Water provided a 100 year flood flow of 100 cubic feet per second (cfs). The water control structure should be designed to pass the 100 cfs flow without causing flood pool elevations in the wetland from exceeding 972.5 MSL. A flood pool elevation of 972.5 MSL would not reach the yard of a residence located north of the west wetland area. A flood pool elevation of 972.5 MSL would cover a surface area of 3.0 acres in the west wetland area and 18.0 acres in the east wetland area.

8A.2 Water Control Structure Design Criteria

The water control structure should be constructed in the gap of the abandoned railroad grade. The existing railroad grade would serve as a dam and the structure could be constructed with minimal disturbance to the wetlands. The railroad grade provides easy access to the water control structure site for construction maintenance.

The water control structure should be designed to retain a normal pool elevation of 971.0 MSL and pass a 100 yr. flood flow of 100 cfs without exceeding a flood pool elevation of 972.5 MSL.

It may be desirable or required to provide a drawdown structure to drain the restored wetland areas for maintenance. Whether a drawdown structure is installed or not will be determined by public agency comments during the permitting process.

9. Functionality of the Proposed Project with Respect to the Lakes

9.1 The Role of Phosphorus in Lakes

Wetlands are widely recognized as having value in preserving the water quality of lakes. The most common reason for this is that wetlands provided buffering and filtration of lake-bound waters which carry nutrients, eroded sediment, and other pollutants into the lake from the surrounding watershed. With regard to water quality, phosphorus is studied and measured more than any other nutrient. A huge volume of literature exists on the fate and effects of increased phosphorus levels in living aquatic systems. This is because relatively small changes in phosphorus levels can have profound effects on an aquatic ecosystem, with changes in functioning at all trophic levels. Phosphorus levels elevated to .08 parts-per-million from a more typical Lake Gage summertime level of .03 parts-per-million was enough to boost algal populations and cause the bloom associated with much poorer water clarity than typical in the year 2000 season. This is because phosphorus is typically the limiting factor in the growth of planktonic algae. These tiny plants float in the water column and are the primary producers forming the most basic level of the aquatic food chain. An algae "bloom" is a rapid increase in algal populations in a short period of time. Repeated algae blooms or an elevated biomass of algae over a long period of time has ramifications at all levels of ecosystem functioning. More immediately evident is the destruction of water clarity, quickly affecting the aesthetic and recreational value of a lake. The term "eutrophication" is often used to describe long-term increased phosphorus levels accompanied by the corresponding higher primary productivity. To some extent natural lakes like Lime and Gage undergo eutrophication naturally over time as soil and organic materials migrate to these depressions in the landscape driven by rainfall, wind, and snow-melt runoff. The some of these materials become committed to the lakes sediments and eventually lead to a filling-in and finally succession into a bog or wetland, and ultimately upland. Examples of glacial depressions in each of these states can be found in Steuben County. Human land uses and urban development can be said to hasten this process of natural "eutrophication" or lake succession although the rapid introduction of soil borne and dissolved pollutants are a mere millisecond on the geological time scale that would normally govern this process. Because of this, ecosystem adjustment does not occur as it naturally would, and systems can become unstable, exhibiting signs of disturbance, shifts to disturbance oriented species and unstable water chemistry and fish populations. In the case of Lake Gage sustained phosphorus enrichment will likely eliminate the presence of coldwater fisheries habitat needed by the lakes trout and cisco populations. These fish must retreat to deeper areas of the lake during the summer to find required cold temperatures, but must also stay shallow enough to avoid long-term exposure to an oxygen void that develops from the bottom up during the summer. As plankton production in the upper strata increases in response to increased nutrients, dead planktonic organisms lose buoyancy and sink into the lower strata. The decomposition of these organisms feeds the production of oxygen consuming (aerobic) bacteria. As the amount of this bacterial activity increases the oxygen deficit near the lake bottom can become more intense and the layer of low oxygen or "anoxic" water can thicken. If it thickens enough, coldwater fish can be pushed above their required cool thermal strata and stress and the loss of these species can eventually result. This process has probably already eliminated cold-water fish habitat on the majority of Indiana lakes where it existed in pre-settlement times. The challenge on Lake Gage is to find ways to reduce the phosphorus load to the lake to slow or stop this process and maintain desirable habitat and water quality. While Lime Lake is much shallower and does not

have summertime coldwater habitat it is still affected by water quality in Lake Gage because it lies downstream of it and is fed by flow from Lake Gage. Both the wetland project areas and the stream restoration are designed to be part of overall watershed management efforts to limit or buffer long-term phosphorus loads to the lakes by keeping nutrients and sediments on the watershed.

9.2 Functionality of the East and West Wetland Areas

Wetlands are often looked upon as protectors of lake health for their tendency to filter nutrients, sediments, and other pollutants from lake-bound runoff. Wetlands are often constructed as treatment systems for removing pollutants from wastewater. Several major mechanisms of phosphorus removal are present in wetland systems. Some of these mechanisms remove phosphorus permanently and sequester it in the wetland while some simply hold phosphorus on the wetland temporarily releasing it at a later time. Phosphorus often enters Indiana waters bound to soil particles or as part of dead organic material (detritus). A pond or wetland provides a sediment basin where the velocity of lake-bound flowing waters slows enough to allow these particulates to settle out. Some of these particulates will likely remain in the wetland permanently as peat deposits while some will eventually decompose and release their phosphorus in a dissolved state. Within a ponded wetland containing submersed aquatic vegetation, calcium carbonate (marl) will precipitate in chemical response to the process of plants carrying on photosynthetic food production. When this occurs the precipitating marl will often bind with particulate phosphorus, committing permanently to the sediments as settling occurs. Plants or algae within a wetland will also draw dissolved phosphorus from the wetlands bottom (hydrosoil) or waters and utilize it to support their own growth. Together these mechanisms can result in a net loss of phosphorus in waters flowing through a lake, pond, or wetland, especially during the plant growth of summer months. The extent of this function is highly variable with the concentration of phosphorus entering the system, the retention time of the system, the time of year/growing season, temperature, and a number of other variables. This function and its variability can be demonstrated to some extent in the Concorde Creek watershed using the pond just upstream of the east and west wetland project areas. On July 16 a water sample was collected from Concorde Creek just upstream of the pond during baseline flow conditions. It showed a total phosphorus concentration of .08 parts-per-million. Out-flowing pond waters also contained .08 parts-per-million total phosphorus. After a storm event later that day the stream flowing into the pond showed .12 parts-per-million total phosphorus while the out-flowing pond waters still contained .08 parts-per-million. This effect will typically continue though the pond's retention time showing a net loss of phosphorus to the pond. In this pond we know that a portion of this phosphorus load remains on the pond bottom as settled soil attached nutrients with another portion likely remaining in the plants and algae in the pond. At times of low water a considerable silt deposit is evident near the pond's inflow channel. Probing of the pond bottom on August 1, 2005 revealed the pond bottom to contain an average of 7.6 inches of soft sediment overall.

The purpose of the wetland project is to enhance these mechanisms of phosphorus removal in this area by altering the hydrology and vegetation in the wetland. At present man-made channelization of flows through the wetland conduct Concorde Creek through this area at a higher velocity than it probably would have under a more natural flow regime that probably would have included impoundment by beaver ponds. This hastening of flow through the

wetland area provides for little settling of particulates, especially at moderate and low flow conditions when little inundation of surrounding wetland ground takes place. The channelization also results in the repeated inundation and re-drying of the wetland soils along the streambed in response to flow changes. The non-native invasive Reed Canary Grass *Philaris arundenacia* has capitalized on this disturbance and heavily colonized the lower streambed excluding most native wetland plants that could provide a more diverse flora with a better root structure for stabilization of wetland soils and a higher stem density to impede and slow the passage of high flows through the wetland, allowing for a more complete attenuation of flowing waters. The short duration of flooding in the channelized area also prevents the growth of submersed aquatic vegetation that can help induce marl precipitation helping to settle phosphorus from stream waters. The defeat of the channelization of this section of Concorde Creek coupled with active management for submersed aquatic vegetation and a diverse mix of native emergent wetland plants will help enhance the function of this wetland area for Lake Gage and Lime Lake as well as increasing the value of this area as wildlife habitat.

9.3 Quantifying Wetland Phosphorus Removal and its Functionality with Regard to the Lakes

Wetland phosphorus removal characteristics can be quantified by continual monitoring of flow-through water volume and its phosphorus content to produce a figure for annual net retention of phosphorus. Because of the number of variables involved it will not be possible to quantify an annual net phosphorus removal of the project pro forma with much certainty, but an estimate can be made based on data from the literature. Data collected in constructed treatment wetlands have shown annual retention rates as high as 2.72 grams per square meter of wetland per year (Abtew 2004). A phosphorus mass loading model (Richardson and Qian 2000) was developed from the North American Wetland Database. This work indicated that low nutrient input natural wetlands could assimilate about 1g per square meter per year without alteration in ecosystem structure or functioning. As estimated in the Lake Gage and Lime Lake Diagnostic Study (Aquatic Enhancement 2002) at least 161.15 kilograms of annual phosphorus loading is carried by Concorde Creek from Crooked Lake to Lake Gage and Lime Lake annually comprising approximately 20% of the Lake Gage annual phosphorus budget. Because this nutrient input will flow through the proposed wetland system we can calculate a theoretical annual phosphorus removal rate using the 1 gram per meter assimilative rule, the higher figure of 2.72 grams per square meter, and the area of our proposed wetland.

Wetland Area (acres)	Wetland Area (sq.m)	Est. ann. P retention. g/m²	Tot. ann. Est. P retention (g)	Tot. ann. Est. P retentn. (kg)
6.6	26709.3	1.0	26709.3	26.7
6.6	26709.3	2.7	72115.0	72.1

TABLE 9-1

Taking these estimates we can manipulate the estimated kilograms of phosphorus runoff previously entered into the predictive model for the mean annual phosphorus concentrations for Lime Lake and Lake Gage as part of the Lake Diagnostic Study (Aquatic Enhancement 2002) to estimate possible project effects on the lakes. Utilizing the annual phosphorus loading, and other limnological data, a prediction of long-term average in-lake phosphorus has already been made. (Vollenweider 1975) defined the following relationship:

$P = \frac{L}{\quad}$

$10 + z\rho$

Where: P = in-lake concentration of total phosphorus (mg/L)
$L\rho$ = areal phosphorus loading (g/m^2 lake area per year)
10 is a constant
z = mean depth
ρ = hydraulic flushing rate or dilution rate = 1/hydraulic residence time

Lake	Total ann P loading (kg)	Lake area (m)	areal loading (g/sq-m)	Mean Depth (m)	Dilution Rate (yrs)	Predicted Phos. (mg/l)
Gage	804.46	1323323.22	0.608	9.17	0.61	**0.039**
Lime	467.6	230671.02	2.027	2.19	14.29	**0.049**

TABLE 9-2

We can then recalculate the Vollenweider figure after reducing Total Annual Phosphorus loading to Lake Gage by the 1 gram per square meter figure. Phosphorus loading to Lime Lake is also in-turn recalculated based on the new phosphorus concentration of its flows from Lake Gage.

Lake	Total ann P loading (kg)	Lake area (m)	areal loading (g/sq-m)	Mean Depth (m)	Dilution Rate (yrs)	Predicted Phos. (mg/l)
Gage	777.76	1323323.22	0.588	9.17	0.61	**0.038**
Lime	450.55	230671.02	1.953	2.19	14.29	**0.047**

TABLE 9-3

Recalculating the Vollenweider figure after reducing Total Annual Phosphorus loading to Lake Gage by the more optimistic 2.72 grams per square meter of wetland figure can then also be used to produce predicted concentrations.

Lake	Total ann P loading (kg)	Lake area (m)	areal loading (g/sq-m)	Mean Depth (m)	Dilution Rate (yrs)	Predicted Phos. (mg/l)
Gage	732.36	1323323.22	0.553	9.17	0.61	**0.035**
Lime	434.24	230671.02	1.882	2.19	14.29	**0.046**

TABLE 9-4

At a net annual removal rate of 1 gram of phosphorus per square meter of wetland we get a prediction of a one part per billion difference in mean Lake Gage phosphorus content and a two part per billion difference in Lime Lake. At the more optimistic removal rate of 2.72 grams of phosphorus per square meter of wetland, the difference is four parts-per-billion and three parts-per-billion for Gage and Lime respectively. While both would be substantial changes to realize from a single wetland restoration in the watershed, the amount of change might not be large enough to be immediately apparent to lake users within the context of seasonal variations. Maximum benefit may be realized during extreme environmental variation like that experienced in the year 2000 algae blooms. The actual function of a given wetland with regard to long-term phosphorus removal will be dependant on many variables including, flow regime, the phosphorus content of inflows, climatic changes, and changes in the wetland plant community. The primary mechanisms of long-term phosphorus removal in wetlands include: adherence to wetland soils, commitment of phosphorus containing organic matter to the wetland sediments as peat, the binding of phosphorus to precipitating marl (calcium carbonate), and investment in the roots (rhizomes) of perennial vegetation. Wetlands to not indefinitely hold their phosphorus load but tend to secrete some portion of collected phosphorus acting as a source rather than a sink at times. In spring and summer plants and algae growing within the wetland will absorb

phosphorus to support growth. In late fall and winter, senescence and decomposition of wetland plants normally mobilizes a portion of phosphorus collected during the growth phase. Lake Gage and Lime Lake can expect to receive a portion of collected phosphorus back from the wetland during this time. This retiming of phosphorus release to the lakes can, however, supersede the possible benefit of the wetland in terms of long term net phosphorus filtration and storage. In terms of water clarity and trout and cisco habitat, phosphorus present in the lake's surface waters has its greatest effect during the spring, summer, and early fall when warm temperatures and ample sunlight convert elevated nutrient levels to algal biomass quickly. Obviously this coincides with the peak period of lake use when an algae bloom is most likely to detract from the aesthetics of the lake to most users. We also know that trout and cisco habitat reaches its most critical time during the summer or early fall as oxygen levels in the lower lake strata decrease. The "Cisco layer" is a layer of water with a temperature below 20 degrees C. and dissolved oxygen levels above 3 parts-per-million needed by this species of native whitefish for survival. As late summer and early fall stratification progress the cisco layer tends to become thinnest in response to increasing water temperatures above and oxygen deficits built by decomposing detritus (dead material) below.

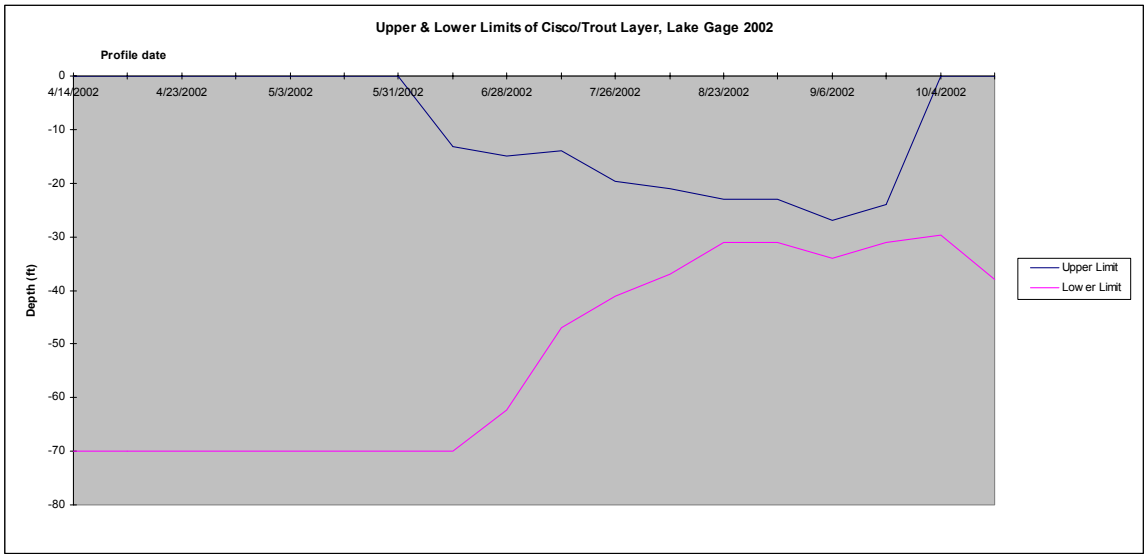


FIGURE 9-1

Outside of this summer season mixing of the water column and cooling of the lake, suitable cisco habitat quickly becomes widespread with respect to both temperature and oxygen levels. Phosphorus entering during the growing season will obviously have a more important bearing on this habitat. Thermal stratification will likely contain much of the inflowing dissolved phosphorus concentrated in the epilimnion (upper water layer) during the warm season due to differences in density among thermal layers. In effect the stream inflow entering at a similar temperature to the lake waters slides across the top of the lake over the cooler layers. This places the summertime dissolved phosphorus inflows near the lake surface where algae can quickly take advantage of the nutrient, utilizing light for photosynthetic food production. Conversely, late fall and winter phosphorus input from wetlands will be more free to mix with various levels of the water column, granting time and volume. Attenuation and dilution will take place. Oxygen levels will remain high due to the higher oxygen affinity for cooler waters. Algal growth will be slow due to the metabolic affects of the cold temperatures and complete mixing

will dilute winter inflows throughout the lakes waters before the critical summer season. This buffering effect can contribute to improved water quality and habitat regardless of net annual retention of phosphorus by the wetland system. To maximize both the net phosphorus retention potential and the buffering of phosphorus release from the wetlands, active management of the projects plant community should be carried out during project construction and on an ongoing basis. The following goals for installing and managing beneficial vegetation in the wetland project areas can help maximize wetland function with respect to Lime Lake and Lake Gage.

• Maintain significant wetland areas in submersed aquatic vegetation.

Submersed aquatic plants perform their gas exchange beneath the waters surface, placing oxygen directly into wetland waters. This process helps induce the precipitation of marl (calcium carbonate) which can pull phosphorus from the water column and commit it to the wetland sediments. Submersed plants will also help maintain oxygen levels in the wetland. Keeping dissolved oxygen levels high in the wetland creates iron oxides at the soil/water interface. Iron oxides have a very high affinity for phosphorus and tend to bind quickly with phosphorus that attempts to resolubilize from the wetlands soils. This has the effect of chemically locking phosphorus into the wetland hydrosoil. Elodea *Elodea canadensis*, Coontail *Ceratophyllum demersum* and Curlyleaf pondweed *Potamogeton crispus* are already present in the streambed and may readily colonize the wetland project areas. Curlyleaf pondweed is a non-native invasive species that should be discouraged from dominating the submersed plant community. To encourage a more open architecture in the submersed aquatic plant growth and help promote a more fish and wildlife suited plant community Largeleaf pondweed *Potamogeton amplifolius,* and American pondweed *Potamogeton nodosus* should be planted.

• Maintain the pool edges and marginal wetland areas in diverse native vegetation.

Native emergent aquatic species, sedges and grasses will form a dense root structure to help stabilize wetland soils. Productivity and wetland function will be maximized with a diverse mix of native plants. Invasive species such as Purple loosestrife *Lythrum salicaria* , invasive Phragmites *Phragmites australis, and* Reed Canary Grass *Philaris arundinacea* should be controlled or eliminated.

Common carp *Cyprinus carpio* should be excluded from the project wetlands whenever possible. The Lake Gage and Lime Lake Association has already prevented the passage of large carp into the wetland project area streambed from upstream with the placement of a metal barrier. Barriers to passage from downstream should also be maintained. These fish in large numbers could have a negative influence on wetland functioning due to feeding activity in the wetland.

Installation and management of the proposed east and west wetland areas together with continued pursuit of other in-lake and a watershed remedies recommended in the Lake Gage and Lime Lake diagnostic study can have a significant effect on long-term water quality. Switching the lake residents to a centralized wastewater collection system (taking place at the time of this report) should also boost chances at significant water quality improvement and protection at Lime Lake and Lake Gage. Whereas the outflow from Crooked Lake is a significant source of phosphorus to Lime Lake and Lake Gage, successful efforts at improving water quality there will also make a significant difference for the residents and users of Lime Lake and Lake Gage.

9.4 Functionality of the Stream Restoration

Significant erosion has taken place in the lower reach of Concorde Creek with eroded sediment ultimately ending up in Lake Gage. Eroded soil can be a significant carrier of nutrients. Much of the phosphorus that enters Indiana lakes in runoff and stream waters is attached to soil particles. Erosion of a streamcourse is a natural process. Streams naturally meander over time with a general tendency toward a winding course and a lengthening run. At some point in the past the lower portion of Concorde Creek was apparently straightened and channelized to form a bypass channel around the sawmill pond that inundated the streams original meandering course. This artificially shortened the length of travel of this portion of the stream. The resulting increase in flow velocity has led to instability as the stream erodes its way back into a natural course over time. The purpose of the stream restoration is to bypass this process and reroute the stream back to a more natural and more stable course, thereby stopping the current erosion and resulting contribution of nutrients to the lake.

9.5 Quantifying the Benefits of the Stream Restoration to the Lakes

Absent a pin study over time it's difficult to gage the speed of erosion occurring on the lower reach of Concorde Creek. Pin studies utilize pins driven into the stream bank and marked to measure the rate of bank erosion over an extended period of time. We can however, arrive at an estimate of the potential contributions of phosphorus to the lakes from the streambank erosion if we make some assumptions. Using an approximate phosphorus content of 638 milligrams of phosphorus (P) per kilogram of eroded soil (Mills et al 1985) and a rough volume of soil eroded from the streambanks we can arrive at a phosphorus quantity. Using basic measurements of the eroded section of lower Concorde Creek and assuming that only 50% of the current channel was formed by erosion we can calculate the amount of phosphorus in the eroded soil.

Avg. Chan. width top (ft)	25.0	Kg eroded soil per cubit ft	45.4
Avg. Chan width bottom (ft)	9.0	Total Kg eroded soil	1157700.0
Avg. Chan depth (ft)	10.0	est. mg phos/Kg sol	638.0
Chan. Cross sectional area	170.0	mg of phosphorus	738612600.0
Eroded Channel Length (ft)	300.0	est. Kg of phosphorus	739
Est. Channel Volume (cu ft)	51000.0		
Est. Eroded Channel Vol.	25500.0		

TABLE 9-5

An estimated phosphorus content of the eroded soil is 739 kilograms. This is a significant amount of phosphorus considering that an entire year's phosphorus loading for Lake Gage is estimated to be 806 kilograms. Looking at the phosphorus contributions from this area on a year by year basis for the many years since the eroding channel was installed would make this number seem less significant, but the length of the eroded stream reach is probably extending in the upstream direction as is typical of this type of erosion. This is likely to cause increases in the length of the eroded section over time. As the upstream watershed becomes more urbanized stream flows can also increase, exacerbating the current problem. A streambed restoration which achieves a more stable stream morphology will be a single step which results in a decrease in phosphorus inputs to the lakes for many years beyond the project completion.

10 Wetland Delineation and Floristic and Wetland Assessment

A wetland delineation and a wetland floristic and wetland assessment were performed to: a) identify and approximately locate existing on-site wetlands, b) determine baseline quality of existing on-site wetlands, and c) assess the benefit of the proposed engineering project to the function and quality of the existing on-site wetlands.

10A Wetland Delineation

10A.1 Introduction

This Wetland Delineation Report fulfills the purpose of determining the identity and location of wetlands for Section 404 of the Clean Water Act. The objective of the Act is to maintain and restore the chemical, physical, and biological integrity of the waters of the United States. Section 404 of the Act authorizes the Secretary of the Army, acting through the Chief of Engineers (Army Corps of Engineers), to issue permits for the discharge of dredged or fill material into the waters of the United States, including wetlands.

A wetland delineation was conducted on private property (with landowner permission) as part of a wetland functional assessment for the Lake Gage-Lime Lake L.A.R.E. Engineering Feasibility Study. The purpose of the wetland delineation was to determine the quality and extent of on-site wetlands in relation to potential impacts of the proposed watershed improvements.

Blue Heron Ministries, Inc. acting as consultant for the Lake Gage/Lime Lake Association, conducted a field investigation, determining the presence, location, and boundaries of on site wetlands on May 18 and 20, 2005. The investigation was conducted according to technical guidelines set forth in the 1987 Corps of Engineers Wetlands Delineation Manual (Technical Report Y-87-1).

10A.2 Methods

According to the U.S. Army Corps of Engineers (Federal Register 1982) and the U.S. Environmental Protection Agency (Federal Register 1980), wetlands are defined as:

> Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

The multi-parameter approach for determining wetlands as set forth in the 1987 Manual lists three parameters that must exhibit positive indicators in order for an area to be determined a jurisdictional wetland. The three parameters are hydrophytic vegetation, hydric soils, and wetland hydrology. If all three parameters are met in a given area, the area is determined to be a wetland. Conversely, if positive indicators are missing for any one of the three parameters, the area is determined to be a non-wetland. The point at which one or more of the three parameters "drops out" is considered the extent of the wetland area. Points connected at the perimeter or boundary of the wetland constitute the wetland delineation.

According to the 1987 Manual, hydrophytic vegetation is defined as "the sum total of macrophytic plant life that occurs in areas where the frequency and duration of inundation or soil saturation produce permanently or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present."

For each plant community type (e.g. forest, field, scrubland, etc.) within a given area, the dominant, or controlling vegetation is sampled. The dominant plants of each apparent layer present (e.g. canopy, sub-canopy, vines, and herbaceous) are assigned a wetland indicator status according to the National List of Plant Species That Occur In Wetlands: North Central (Region 3). The indicator categories and definitions are as follows:

- Obligate wetland plants (OBL); plants that occur almost always (>99%) in wetlands.
- Facultative wetland plants (FACW); plants that occur usually (>67% to 99%) in wetlands.
- Facultative plants (FAC); plants with a similar likelihood (33% to 67% of occurring in both wetlands and nonwetlands.
- Facultative upland plants (FACU); plants that occur sometimes (1% to 33%) in wetlands.
- Obligate upland plants (UPL); plants that occur rarely (<1%) in wetlands.

The hydrophytic vegetation parameter is considered met when greater than 50% of the dominant vegetation for any sampled plant community are OBL, FACW, or FAC (excluding FAC-).

According to the 1987 Manual, a hydric soil is defined as "a soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation (U.S. Department of Agriculture Soil Conservation Service, 1980 and the National Technical Committee for Hydric Soils, 1986)."

For a given area, a pit is dug and the soil profile or layers are observed. Several indicators are available for determining whether a given soil meets the definition and criteria for hydric soils:

- Organic soils (Histosols); greater than 50% (by volume) of the upper 32 inches of soil is composed of organic soil material.
- Histic epipedon; an 8 to 16 inch layer of organic matter at or near the surface of a mineral soil.
- Sulfidic material; mineral soils that emit a rotten egg odor indicates the presence of hydrogen sulfide.
- Aquic or peraquic moisture regime; the absence of dissolved oxygen in the soil caused by the presence of ground water always at or near the surface.
- Reducing soil conditions; in mineral soils, ions of iron have been transformed from the ferric to ferrous state as detected by an alpha-alpha-dipyridil field test.
- Soil colors; mineral soils that are either gleyed (gray color) or exhibit bright mottling and/or low matrix chroma as determined using a Munsell Color Book immediately below the A-horizon or 10 inches (whichever is shallower). Mineral hydric soils will usually have a matrix chroma of 2 or less in mottled soils or matrix chroma of 1 or less in unmottled soils.

- Soil appearing on hydric soils list; the soil profile of a soil that matches the mapped soil unit and is listed as a hydric soils by the National Soils Committee on Hydric Soils.
- Iron and Manganese concretions; soft, dark brown or black masses segregated into oxide concretions in the upper 3 inches of the soil profile.

A positive presence of any one of the above soil characteristics indicates that the hydric soil parameter is met.

The third parameter, wetland hydrology, is defined, according to the 1987 Manual, as areas "where the presence of water has an overriding influence on characteristics of vegetation and soils due to anaerobic and reducing conditions, respectively. Such characteristics are usually present in areas that are inundated or have soils that are saturated to the surface for sufficient duration to develop hydric soils and support vegetation typically adapted for life in periodically anaerobic soil conditions." The area must be inundated or saturated with a frequency of 1 out of every 2 years and for a duration of at least 5% of the growing season (minimum of 10 consecutive days in northeast Indiana) in order for the wetland hydrology to be considered met.

Recorded data may be used to determine frequency and duration of water on a site. These include stream gage data, lake gage data, tidal gage data, flood predictions, and historical records.

Field observations for determining wetland hydrology include:

- Visual observation of inundation.
- Visual observation of soil saturation; within a soil pit 16 inches deep water must be observed flowing into the hole at a depth of 12 inches or less (major root zone).
- Watermarks; stains appearing as lines on vertical objects within the area (e.g. trees, bridges, posts, etc.) indicate height of recent inundation.
- Drift lines; water-born debris (e.g. dead plant material, sediment, litter, etc.) laid down in lines parallel to water flow indicate the minimum extent of flooding.
- Sediment deposits; objects on or above the soil surface that are encrusted by a coating of sediment indicate flooding.
- Drainage patterns within wetlands; scoured soil, bare soil areas, debris stacked in vertical objects perpendicular to the flow indicate flooding.

The above indicators constitute the list of primary indicators. Any positive observation of any one of the above primary indicators meets the wetland hydrology parameter. In the absence of the primary indicators, the observed presence of at least two secondary indicators of wetland hydrology may also meet the wetland hydrology parameter. The secondary indicators of wetland hydrology are:

- Oxidized root channels; within the upper 12 inches of the soil profile, orange-colored coatings on the walls of living root channels indicate soil saturation.
- Water-stained leaves; blackened leaves on the soil surface indicate ponding of water since the previous autumn.

- Local soil survey data; in unaltered, positively-mapped and correlated soils, hydrology data may be obtained from the local soil survey.
- FAC-neutral test; for the dominant vegetation recorded for the area, if after all facultative (FAC) plants are ignored, greater than 50% of the remaining plants are FACW or OBL the test is passed.

For the study site, two baselines were established. County Road 550W (CR 550W) and West Orland Road served as baselines. The baselines were perpendicular to the general site drainage. Four east/west transects and four north/south transects were determined to be sufficient to adequately sample the pre-scouted plant community types, depressions, mapped hydric soil units, and potential wetland areas. Transects 1 through 4 began at CR 550W. Transects 5 and 6 began in upland areas and crossed the prominent drainage channel perpendicular to the flow. West Orland Road served as the baseline for Transects 9 and 10. Transects 7 and 8 were deemed unnecessary in the field due to the likelihood that these areas of the study area would not be impacted by projected engineering improvements. Eight transects were established in the field. Data points were established to sample vegetation, soils, and hydrology at representative locations within each vegetative cover type on each of the eight transects (see Data Points Map 10-4). The recorded data forms are included in Appendix C. Wetland determinations were made for areas meeting all three of the wetland parameters. Wetland boundaries were not marked in the field due to the nature of property ownership (private property). The approximate wetland boundaries were located and mapped using a Global Positioning System unit with graphic file transfer to ArcView GIS (see Wetland Delineation Map 10-3).

10A.3 Discussion

The land features of the approximately 200-acre Lake Gage/Lime Lake L.A.R.E. Engineering Feasibility Study area are typical of the outwash plains and moraines associated with the Northern Lakes and Morainal Natural Region of Indiana. The site contains gently rolling topography and broad, poorly drained swales. Lake Gage composes the western boundary of the study area. The eastern boundary is the pond and instream dam located northeast of the intersection of CR 550W and Orland Road. The study area drainage is generally to the west and flows into Lake Gage. The poorly drained swales constitute a complex of wetlands of "fen" characteristics. The drainage outlet for the fens is the creek channel that flows from Crooked Lake to Lake Gage.

Land use and vegetative community cover types within the study area include gently rolling to steeply sloped woodland; gently to moderately rolling agricultural land; short, steep wooded slopes; a creek; and wetland plant communities consisting of woodland, scrubland, and sedge meadow (see USGS Topographic Map 10-1).

Soils on site include somewhat excessively drained, gravelly, sandy loams on slopes; well drained loamy sands on gently rolling plains; and very poorly drained mucks in lowlands (see Steuben County Soil Survey Map 10-2).

Three distinct areas within the study area were determined to be wetlands according to the 1987 Manual. Beginning upstream the three areas include: a large wetland complex consisting of the main creek channel, associated emergent flats, and large fen lobes; a creekside vegetated bar;

and the former millpond and former creek channel. The wetland areas were delineated and are described as follows:

Section I. Wetland Section I is a large wetland complex consisting of three distinct lobes connected by the main creek channel. The creek channel has been dredged and channelized within its reach through this wetland complex. The channelization minimally impacts the hydrology of the wetland lobes. The complex begins at the base of the instream dam located northeast of the intersection of CR 550W and Orland Road and ends at a point adjacent to Orland Road where the stream valley is narrowed by the upland slopes. The wetland complex is "pinched" by the culvert under CR 550W and by a cut through an abandoned railroad grade. The wetland complex extends off site to the north. An additional portion of the wetland is isolated by the abandoned railroad grade and is considered off-site, as well. The wetland is comprised of scrubland, and sedge meadow or emergent vegetative cover types. The emergent flats associated with the stream channel are vegetated primarily by Reed Canary Grass (*Phalaris arundinacea*), an aggressive, non-native grass species. Two of the lobes are large, high quality fen ecosystems with sedge meadow and scrub wetland vegetation. The wetland complex is charged hydrologically by ground water and is minimally influenced by the seasonally fluctuating level of Crooked Lake upstream of the study area. The outlet of Crooked Lake is a dam that meters flow into the creek channel. At the time of the study the downstream end of the creek channel was dammed by beaver (near Orland Road). The beaver activity raised the water elevation in the main channel and associated flats upstream of the dam to CR 550W. Increased water elevations ranged from 0-30 inches (upstream to downstream). For purposes of wetland characterization Section I is further divided into three subsections. Section IA is located east and north of CR 550W. Section IB is located between CR 550W and the abandoned railroad grade. Section IC is located between the abandoned railroad grade and Orland Road. The total on-site delineated area of Section I is approximately 58.8 acres.

Section IA: Wetland Section IA contains the creek, streamside emergent wetland community, and a high quality emergent and scrub fen community. The area was formerly influenced by beaver activity leaving standing dead trees. The low quality area is exemplified by the following data point (T3 P2) located in the southcentral portion of the wetland:

Hydrophytic Vegetation. The hydrophytic vegetation parameter was considered met with greater than 50% of the dominant vegetation having indicator status of OBL, FACW, of FAC (excluding FAC-). The data station included only an herbaceous layer beneath the dead standing Ash (*Fraxinus pennsylvanica*). The canopy, sub-canopy, and vine strata were absent.

The herbaceous stratum was composed of the following dominant plants:

Reed Canary Grass	*Phalaris arundinacea*	FACW+

Wetland Hydrology. The wetland hydrology parameter was considered met by the presence of the primary indicator of saturated soils in the upper 12 inches of the soil. Soils were observed saturated to the surface with free water in the excavated pit at the surface.

Hydric Soils. The hydric soils parameter was considered met by the presence of a histosol and confirmed soils listing on the National Hydric Soils List. The mapped soil unit was the very poorly drained Houghton muck, a Typic Medisaprists. The excavated soil pit revealed the following profile:

0-16 inches	10YR 2/1 (matrix color)	muck

The high quality portion of the Section exhibits fen-like characteristics and is partially drained by an excavated ditch. The area is exemplified by the following data point (T1 P4) located in the northcentral portion of the wetland:

Hydrophytic Vegetation. The hydrophytic vegetation parameter was considered met with greater than 50% of the dominant vegetation having indicator status of OBL, FACW, of FAC (excluding FAC-). The data station included two vegetative layers.
The canopy and vine strata were absent.

The sub-canopy stratum consisted of the following dominant plants:

American Elm	*Ulmus americana*	FACW-
Pale Dogwood	*Cornus obliqua*	FACW+
Red-Osier Dogwood	*Cornus sericea*	FACW
Pussy Willow	*Salix discolor*	FACW

The herbaceous stratum was composed of the following dominant plants:

Tussuck Sedge	*Carex stricta*	OBL
Spotted Joe-Pye Weed	*Eupatorium maculatum*	OBL
Touch-Me-Not	*Impatiens* sp.	FACW
Sensitive Fern	*Onoclea sensibilis*	FACW
Bulbous Bittercress	*Cardamine bulbosa*	OBL

Wetland Hydrology. The wetland hydrology parameter was considered met by the presence of the primary indicator of saturated soils in the upper 12 inches of the soil. Soils were observed saturated to the surface with free water in the excavated pit at the surface.

Hydric Soils. The hydric soils parameter was considered met by the presence of a histosol and confirmed soils listing on the National Hydric Soils List. The mapped soil unit was the very poorly drained Houghton muck, a Typic Medisaprists. The excavated soil pit revealed the following profile:

0-16 inches	10YR 2/1 (matrix color)	muck

Section IB: Wetland Section IB contains the channelized creek, degraded streamside emergent wetland community, and a degraded emergent and scrub fen community. Remnant stream meanders with deeper pools of water are evident in this section. Downstream beaver activity

impounded water in this area above the typical wetland elevation. The streamside area is exemplified by the following data point (T5 P4) located on the north side of the creek:

Hydrophytic Vegetation. The hydrophytic vegetation parameter was considered met with greater than 50% of the dominant vegetation having indicator status of OBL, FACW, of FAC (excluding FAC-). The data station included two strata. The canopy and vine strata were absent.

The sub-canopy stratum was widely-scattered and was composed of the following dominant plants:

Buttonbush	*Cephalanthus occidentalis*	OBL

The herbaceous stratum was composed of the following dominant plants:

Reed Canary Grass	*Phalaris arundinacea*	FACW+
Tussuck Sedge	*Carex stricta*	OBL

Wetland Hydrology. The wetland hydrology parameter was considered met by the presence of the primary indicator of inundation. Due to recent beaver activity standing water was 10 inches deep at the data point.

Hydric Soils. The hydric soils parameter was considered met by the presence of a histosol and confirmed soils listing on the National Hydric Soils List. The mapped soil unit was the very poorly drained Houghton muck, a Typic Medisaprists. The excavated soil pit revealed the following profile:

0-16 inches	10YR 2/1 (matrix color)	muck

The low quality fen community was exemplified by the following data point (T5 P6) located on a gentle slope above the wetland flat north of the creek:

Hydrophytic Vegetation. The hydrophytic vegetation parameter was considered met with greater than 50% of the dominant vegetation having indicator status of OBL, FACW, of FAC (excluding FAC-). The data station included three strata. The vine stratum was absent.

The canopy stratum was composed of the following dominant plant species:

Box Elder	*Acer negundo*	FACW-
Pussy Willow	*Salix discolor*	FACW

The sub-canopy stratum was composed of the following dominant plants:

Nannyberry Viburnum	*Viburnum lentago*	FAC+
Elderberry	*Sambucus canadensis*	FACW-
Pale Dogwood	*Cornus obliqua*	FACW+

The herbaceous stratum was composed of the following dominant plants:

Reed Canary Grass	*Phalaris arundinacea*	FACW+
Common Reed	*Phragmites australis*	FACW+
Tussuck Sedge	*Carex stricta*	OBL

Wetland Hydrology. The wetland hydrology parameter was considered met by the presence of the primary indicator of soil saturation within 12 inches of the surface. At the data point, the soil was saturated at the surface. Free water was observed at 12 inches within the excavated pit.

Hydric Soils. The hydric soils parameter was considered met by the presence of a histosol and confirmed soils listing on the National Hydric Soils List. The mapped soil unit was the very poorly drained Houghton muck, a Typic Medisaprists. The excavated soil pit revealed the following profile:

0-16 inches	10YR 2/1 (matrix color)	muck

Section IC: Wetland Section IC contains the channelized creek, degraded streamside emergent wetland community, and a high quality emergent and scrub fen community. Downstream beaver activity impounded water in this area above the typical wetland elevation. The streamside area is exemplified by the following data point (T6 P3) located southeast side of the creek:

Hydrophytic Vegetation. The hydrophytic vegetation parameter was considered met with greater than 50% of the dominant vegetation having indicator status of OBL, FACW, of FAC (excluding FAC-). The data station included one strata. The canopy, sub-canopy, and vine strata were absent.

The herbaceous stratum was composed of the following dominant plants:

Reed Canary Grass	*Phalaris arundinacea*	FACW+

Wetland Hydrology. The wetland hydrology parameter was considered met by the presence of the primary indicator of inundation. Due to recent beaver activity standing water was 8 inches deep at the data point.

Hydric Soils. The hydric soils parameter was considered met by the presence of a histosol and confirmed soils listing on the National Hydric Soils List. The mapped soil unit was the very poorly drained Houghton muck, a Typic Medisaprists. The excavated soil pit revealed the following profile:

0-16 inches	10YR 2/1 (matrix color)	muck

The high quality portion of the Section exhibits fen-like characteristics and is partially drained by an excavated ditch. The area is exemplified by the following data point (T6A P10) located in the central portion of the wetland:

Hydrophytic Vegetation. The hydrophytic vegetation parameter was considered met with greater than 50% of the dominant vegetation having indicator status of OBL, FACW, of FAC (excluding FAC-). The data station included two vegetative layers.
The canopy and vine strata were absent.

The sub-canopy stratum consisted of the following dominant plants:

Red-Osier Dogwood	*Cornus sericea*	FACW
Poison Sumac	*Toxicodendron vernix*	OBL

The herbaceous stratum was composed of the following dominant plants:

Tussuck Sedge	*Carex stricta*	OBL
Blue-Joint Grass	*Calamagrostis anadensis*	OBL
Marsh Fern	*Thelypteris palustris*	FACW+
Shining Aster	*Aster firmus*	FACW
Marsh Pea	Iathyerus palustris	FACW

Wetland Hydrology. The wetland hydrology parameter was considered met by the presence of the primary indicator of inundation. Less than 1 inch of standing water covered the surface at this data point. Wetland hydrology was influenced by downstream beaver activity.

Hydric Soils. The hydric soils parameter was considered met by the presence of a histosol and confirmed soils listing on the National Hydric Soils List. The mapped soil unit was the very poorly drained Houghton muck, a Typic Medisaprists. The excavated soil pit revealed the following profile:

0-16 inches	10YR 2/1 (matrix color)	muck

Section II. Wetland Section II is a streamside wetland developed on the inside of the bend of the creek. The wetland is comprised of a degraded emergent vegetative cover type. The wetland is charged hydrologically by ground water and is influenced by the seasonally fluctuating creek levels. The creek appears to overflow its bank very irregularly and infrequently at this point. The wetland elevation is approximately 4 inches above the creek water level. No evidence of recent debris or sediment deposits occurred within this Section. The delineated area of Section II is approximately 0.25 acres. Additional streamside wetlands similar to this section were evident downstream within the unchannelized portion of the creek. The additional areas were not documented.

The emergent plant community of the wetland is exemplified by the following data point (T9 P2):

Hydrophytic Vegetation. The hydrophytic vegetation parameter was considered met with greater than 50% of the dominant vegetation having indicator status of OBL, FACW, of FAC (excluding FAC-). The data station included one vegetative stratum. The canopy, sub-canopy, and vine vegetative layers were absent.

The herbaceous stratum consisted of the following dominant plants:

Reed canary Grass	*Phalaris arundinacea*	FACW+
Touch-Me-Not	*Impatiens* sp.	FACW
Stinging Nettle	*Urtica dioica*	FAC+
Arrow-Leaf Tearthumb	*Polygonum sagittatum*	OBL

Wetland Hydrology. The wetland hydrology parameter was considered met by the presence of the primary indicator of saturation within 12 inches of the surface. The soil was saturated at the surface at the data point. Free water was observed at 14 inches within the excavated pit. Oxidized rhizospheres (iron oxide deposits on living root channels) were observes within 9 inches of the surface.

Hydric Soils. The hydric soils parameter was considered met by the presence of a hystic epipedonn and organic staining in layers of sandy soils. The mapped soil unit was the somewhat poorly drained Riverdale loamy sand, an Aquic Arenic Hapludalfs. The observed soil profile did not correspond with mapped soil unit. The excavated soil pit revealed the following profile:

0-9 inches	10YR 3/1 (matrix color)	muck
9-11 inches	2.5Y 5/3 (matrix color)	sand
11-18 inches	2.5Y 2.5/1 (matrix color)	sand (with organic staining)

Section III. Wetland Section III is a seasonally inundated, forested wetland. The wetland was a former creek meander that was isolated from the main channel by the construction of a millpond and excavation of a creek by-pass channel. The former creek meander wetland is within the basin bottom of the former millpond and outlet race. The entire basin bottom is not wetland. Remnants of the millpond water control structure are evident within this wetland section. The approximate area of the wetland section is 0.63 acres.

The forested plant community of the wetland is exemplified by the following data point (T10 P2) located upstream of the former millpond dam:

Hydrophytic Vegetation. The hydrophytic vegetation parameter was considered met with greater than 50% of the dominant vegetation having indicator status of OBL, FACW, of FAC (excluding FAC-). The data station included two vegetative stratum. The vine and herbaceous vegetative layers were absent.

The canopy stratum consisted of the following dominant plants:

Cottonwood	*Populus deltoides*	FAC+
Slippery Elm	*Ulmus rubra*	FAC

The sub-canopy stratum consisted of the following dominant plants:

Slippery Elm	*Ulmus rubra*	FAC

Wetland Hydrology. The wetland hydrology parameter was considered met by the presence of the primary indicator of saturation within 12 inches of the surface. The soil was saturated at the surface at the data point. Free water was observed at 10 inches within the excavated pit. Water-stained leaves and mater marks on trees were evident elsewhere within the wetland section and are secondary indicators of wetland hydrology.

Hydric Soils. The hydric soils parameter was considered met by the presence of high organic content within the upper horizon of sandy soils and low-chroma matrix colors in surface horizons. The mapped soil unit was the well drained Oshtemo-Ormas loamy sands, Typic/Arenic Hapludalfs. The observed soil profile did not correspond with mapped soil unit. The excavated soil pit revealed the following profile:

0-6 inches	10YR 2/1 (matrix color)	mucky sand
6-12 inches	10YR 4/1 (matrix color)	gravelly sand

10A.5 Conclusion

A total of approximately 59 acres of wetland was delineated on the Lake Gage/Lime Lake Lake and River Enhancement Engineering Feasibility Study site for purposes of determining Army Corps of Engineers jurisdiction per Section 404 of the Clean Water Act and determining the quality and extent of on-site wetlands in relation to potential impacts of the proposed watershed improvements. Upon field investigation Corps of Engineers field staff, Steve Sprecher, on January 28, 2005, it was determined that all the wetland sections may be considered "adjacent wetlands". Adjacent wetlands are wetlands that due to there proximity to a navigable water of the United States fall under the jurisdiction of the U.S. Army Corps of Engineers.

Jurisdiction of Waters of the United States, including wetlands, by the Army Corps of Engineers carries with it constraints to the development procedure. These constraints are in the form of permits required to perform certain activities within the delineated, jurisdictional wetlands. Development impacts to the jurisdictional wetlands of over 1.0 acre require that the owner apply for and obtain an Individual Permit for the fill activity. Developmental impacts of between 1.0 acre and 0.1 acre require that the owner apply for and receive a General Regional Permit for new construction activities. This permit requires the owner to provide compensatory wetland mitigation to replace the loss of wetlands and Waters of the U.S. Developmental impacts of less than 0.1 acres require no notification to the Army Corps of Engineers. All developmental impacts of any size require notification of the Indiana Department of Environmental Management and the Indiana Department of Natural Resources. Notification to the Indiana Department of Environmental Management may require the owner to apply for and receive a Section 401 permit along with compensatory wetland mitigation.

All construction activity scheduled to occur within any of the delineated wetlands on site must wait until notification of permitting agencies and reception of proper permits from the U.S.

Army Corps of Engineers, the Indiana Department of Environmental Management, and the Indiana Department of Natural Resources.

10B Floristic and Wetland Assessment

10B.1 Introduction

Blue Heron Ministries, Inc. was charged with the task of a) collecting field data in regards to the flora of the wetland ecosystem; b) assessing the floristic quality of the areas in question; and c) offering an opinion as to the "type(s)" of wetland ecosystem(s) found on site. The field investigation was performed as part of the wetland functional assessment portion of the Lake Gage/Lime Lake L.A.R.E. Engineering Feasibility Study.

10B.2 Site

The site is the inlet stream and associated wetlands of Lake Gage. More specifically the site is located downstream of the dam and stream impoundment near the intersection of Orland Road and County Road 550W (CR 550W) and Lake Gage in Section 36, Millgrove Township and Section 1, Jackson Township, Steuben County, Indiana (see Map 10-1). A wetland delineation was conducted pursuant to this study by the same organization. Three wetland areas were delineated within the L.A.R.E. Engineering Feasibility Study area. For the study purposes, the areas are labeled from east to west: Wetland Section I, Wetland Section II, and Wetland Section III (see Map 10-3). Wetland Section I is further divided into three subsections or "lobes" and are further labeled Section IA, IB, and IC (from east to west).

10B.3 Method

A growing-season, botanical survey and floristic assessment of the wetland ecosystems was performed on May 18 and 20, 2005. A time-meander search was performed on each of the three delineated wetland areas. Native and non-native herbaceous and woody plants were observed; identified to species, where practical (or voucher specimens colleted for identification in the office); and names recorded for each of the three areas. Observations of dominant flora immediately adjacent to the study areas were also recorded and included in the study data.

General observations of the site conditions and landscape context were also recorded for assessing the quality and type of wetland ecosystems encountered.

For each area, data were cataloged and a "Floristic Quality Assessment" was performed according to Swink and Wilhelm (1995) and adapted by the Indiana Department of Environmental Management (IDEM). The evaluation checklist for the species encountered is "Floristic Quality Assessment for Plant Communities of Indiana: Species List and Coefficients of Conservatism" by IDEM (2004).

In addition, each area was assessed as to its potential classification as a Tier II wetland per "Draft Rule #99-58" under Title 327 of the Water Pollution Control Board (WPCB).

10B.4 Discussion of Data

Wetland Section I. Wetland Section I is a large wetland complex comprised of a channelized stream; adjacent degraded, emergent wetland plant communities; and adjacent higher quality

sedge meadow and fen wetland communities. The sedge meadow and fen communities are distinct lobes of the wetland complex that drain in a southerly direction into the main stream valley. Wetland Section I is located between the instream dam (near the intersection of Orland Road and CR 550W) and a point along Orland Road where the stream enters a narrower, wooded portion of the valley (see Map 10-6 and Figures 10-1, 10-2, 10-3, and 10-4).

The main stream valley is a natural drainageway that connects Crooked Lake (upstream) with Lake Gage (downstream). The once-meandering stream channel has been dredged and channelized throughout the reach of this section. The stream passes through a culvert under CR 550W and is further ”pinched” by a former railroad grade. The stream, at the time of the investigation, was impacted by beaver activity. A dam was located at the downstream end of Wetland Section I. Water levels were increased between 0-30 inches (upstream to downstream). The dam effectively raised water levels upstream to the CR 550W culvert. Furthermore, former beaver activity was observed upstream of the culvert under CR 550W.

The soil substrate within the wetland was muck. The soil was saturated to the surface or inundated. The immediately adjacent uplands were oak-hickory woodlands and active agricultural fields covering dome-shaped hills of sandy loam and loamy sand soils.

Areas within Wetland Sections IA, IB, and IC directly associated with the main stream channel and impacted by channelization and beaver activity, exhibited plant communities of a degraded nature. Portions of Wetland Sections IA, IB, and IC contained higher quality plant communities located at the upper reaches of the wetland far removed from the impacts of the stream channel itself. Typical of the wetland plant community throughout the degraded stream reach was the area between the CR 550W culvert and the abandoned railroad grade. Vegetation data for the main stream valley was compiled from data points along the entire stream reach within Wetland Section I.

The plant list for the emergent plant communities within the main stream valley follows:

Stream Valley

Scientific Name	Common Name	C-value	Fen Indicator
Carex stricta	COMMON TUSSOCK SEDGE	5	
Cephalanthus occidentalis	BUTTONBUSH	5	
Impatiens capensis	SPOTTED TOUCH-ME-NOT	2	
PHALARIS ARUNDINACEA	REED CANARY GRASS		
Sambucus nigra s. canadensis	COMMON ELDERBERRY	2	
URTICA DIOICA s. DIOICA	TALL NETTLE		
Viburnum lentago	NANNYBERRY	5	

The upper reaches of the lobe of Wetland Section IA are more stable than the area nearest the stream channel. Part of the lobe has a history of livestock grazing. Part of the lobe is artificially drained by an excavated drainage ditch. The drainage is incomplete and the wetland remains saturated perennially due to ground water inputs. The plant list for the emergent and scrub/shrub wetland plant communities within the "lobe" of Wetland Section IA follows:

Wetland Section IA Lobe

Scientific Name	Common Name	C-value	Fen Indicator
Betula pumila	DWARF BIRCH	10	√
Calamagrostis canadensis	BLUE JOINT GRASS	5	
Caltha palustris	COWSLIP	7	
Cardamine bulbosa	BULB BITTERCRESS	4	
Carex aquatilis v. substricta	LONG-BRACTED TUSSOCK SEDGE	8	
Carex comosa	BRISTLY SEDGE	6	
Carex haydenii	LONG-SCALED TUSSOCK SEDGE	8	
Carex sartwellii	RUNNING MARSH SEDGE	7	
Carex stipata v. stipata	COMMON FOX SEDGE	2	
Carex stricta	COMMON TUSSOCK SEDGE	5	
Cicuta maculata	COMMON WATER	6	

	HEMLOCK		
Circaea lutetiana s. canadensis	ENCHANTER'S NIGHTSHADE	2	
Cirsium muticum	FEN THISTLE	8	√
Cornus racemosa	GRAY DOGWOOD	2	
Cornus obliqua	PALE DOGWOOD	5	
Cornus sericea	RED OSIER DOGWOOD	4	
Corylus americana	AMERICAN FILBERT	4	
Dasiphora fruticosa s. floribunda	SHRUBBY CINQUEFOIL	9	√
Equisetum hyemale s. affine	TALL SCOURING RUSH	2	
Eupatoriadelphus maculatus	SPOTTED JOE PYE WEED	5	
Fraxinus pennsylvanica v. lanceolata	GREEN ASH	1	
Geum canadense	WHITE AVENS	1	
Hypericum prolificum	SHRUBBY ST. JOHN'S WORT	4	
Ilex verticillata	WINTERBERRY	8	
Impatiens capensis	SPOTTED TOUCH-ME-NOT	2	
Lathyrus palustris	MARSH VETCHLING	7	
LONICERA sp.	unknown Bush Honeysuckle		
Onoclea sensibilis	SENSITIVE FERN	4	
Osmunda regalis v. spectabilis	REGAL FERN	8	
Oxypolis rigidior	COWBANE	7	
Packera aurea	GOLDEN RAGWORT	4	
Pedicularis lanceolata	FEN BETONY	6	
PHALARIS ARUNDINACEA	REED CANARY GRASS		
Photinia melanocarpa	BLACK CHOKEBERRY	8	
Populus tremuloides	QUAKING ASPEN	2	
Ranunculus abortivus	LITTLE-LEAF BUTTERCUP	0	
Ribes americanum	WILD BLACK CURRENT	5	
Rosa palustris	SWAMPY ROSE	5	
Rubus idaeus v. strigosus	RED RASPBERRY	4	
RUMEX OBTUSIFOLIUS	BITTER DOCK		
Rumex orbiculatus v. borealis	GREAT WATER DOCK	7	

Salix discolor	PUSSY WILLOW	3	
Saxifraga pensylvanica v. pensylvanica	SWAMP SAXIFRAGE	10	
Solidago patula	ROUGH-LEAVED GOLDENROD	8	√
Solidago rugosa	ROUGH GOLDENROD	6	
Spiraea alba	MEADOWSWEET	4	
Symphyotrichum firmum	SHINING ASTER	4	
Toxicodendron vernix	POISON SUMAC	10	
TYPHA x GLAUCA	HYBRID CATTAIL		
Ulmus americana	AMERICAN ELM	3	
Viburnum lentago	NANNYBERRY	5	
Vitis riparia	RIVERBANK GRAPE	1	

The upper reaches of Wetland Section IB are located relatively close to the main stream channel. Although higher in elevation than the main stream valley, the relatively small size of the elevated portion of the section prevented the area from being degraded by invasion of non-native species.

The soil substrate within the wetland was muck. The soil was saturated to the surface. The immediately adjacent uplands were active agriculture covering dome-shaped hills of sandy loam and loamy sand soils.

The plant list for the lobe of Wetland Section IB follows:

Wetland Section IB Lobe

Scientific Name	Common Name	C-value	Fen Indicator
Acer negundo	BOXELDER	1	
Calamagrostis canadensis	BLUE JOINT GRASS	5	
Carex stricta	COMMON TUSSOCK SEDGE	5	
Cephalanthus occidentalis	BUTTONBUSH	5	
Cornus obliqua	PALE DOGWOOD	5	
Impatiens capensis	SPOTTED TOUCH-ME-NOT	2	
PHALARIS ARUNDINACEA	REED CANARY GRASS		
PHRAGMITES AUSTRALIS	COMMON REED		
Salix discolor	PUSSY WILLOW	3	

Sambucus nigra s. canadensis	COMMON ELDERBERRY	2	
Scirpus cyperinus	WOOL GRASS	4	
Viburnum lentago	NANNYBERRY	5	

The upper reaches of the lobe of Wetland Section IC are more stable than the area nearest the stream channel. Part of the lobe is artificially drained by an excavated drainage ditch. However, the drainage ditch does not penetrate the interior of the lobe. The drainage is incomplete and the wetland remains saturated perennially due to ground water inputs. The plant list for the emergent and scrub/shrub wetland plant communities within the "lobe" of Wetland Section IC follows:

Wetland Section IC Lobe

Scientific Name	Common Name	C-value	Fen Indicator
Acer rubrum v. rubrum	RED MAPLE	5	
Caltha palustris	COWSLIP	7	
Cardamine bulbosa	BULB BITTERCRESS	4	
Cardamine pratensis	CUCKOO FLOWER	10	
Carex stipata v. stipata	COMMON FOX SEDGE	2	
Carex stricta	COMMON TUSSOCK SEDGE	5	
Cephalanthus occidentalis	BUTTONBUSH	5	
Cirsium muticum	FEN THISTLE	8	√
Cornus racemosa	GRAY DOGWOOD	2	
Cornus sericea	RED OSIER DOGWOOD	4	
Dasiphora fruticosa s. floribunda	SHRUBBY CINQUEFOIL	9	√
Elymus virginicus	VIRGINIA WILD RYE	3	
Equisetum hyemale s. affine	TALL SCOURING RUSH	2	
Erigeron philadelphicus	MARSH FLEABANE	3	
Eupatoriadelphus maculatus	SPOTTED JOE PYE WEED	5	
Eupatorium perfoliatum	COMMON BONESET	4	
Fraxinus pennsylvanica v. lanceolata	GREEN ASH	1	
Ilex verticillata	WINTERBERRY	8	
Impatiens capensis	SPOTTED TOUCH-ME-NOT	2	
Iris virginica	SOUTHERN BLUE FLAG	5	
Larix laricina	AMERICAN LARCH	10	
Lathyrus palustris	MARSH VETCHLING	7	

LIGUSTRUM OBTUSIFOLIUM	BORDER PRIVET		
LONICERA sp.	unknown Bush Honeysuckle		
Mentha arvensis v. villosa	WILD MINT	4	
Onoclea sensibilis	SENSITIVE FERN	4	
Parthenocissus quinquefolia	VIRGINIA CREEPER	2	
PHALARIS ARUNDINACEA	REED CANARY GRASS		
Prunus serotina	WILD BLACK CHERRY	1	
Pycnanthemum virginianum	COMMON MOUNTAIN MINT	5	
Quercus velutina	BLACK OAK	4	
ROSA MULTIFLORA	MULTIFLORA ROSE		
Rosa palustris	SWAMPY ROSE	5	
Rubus idaeus v. strigosus	RED RASPBERRY	4	
Rubus occidentalis	BLACK RASPBERRY	1	
Salix lucida	SHINING WILLOW	10	
Solidago canadensis	CANADA GOLDENROD	0	
Solidago gigantea	LATE GOLDENROD	4	
Solidago patula	ROUGH-LEAVED GOLDENROD	8	√
Spiraea alba	MEADOWSWEET	4	
Symphyotrichum firmum	SHINING ASTER	4	
Symphyotrichum puniceum	BRISTLY ASTER	7	
Thelypteris palustris v. pubescens	MARSH SHIELD FERN	7	
Toxicodendron radicans s. radicans	POISON IVY	1	
Toxicodendron vernix	POISON SUMAC	10	
TYPHA x GLAUCA	HYBRID CATTAIL		
Viburnum lentago	NANNYBERRY	5	
Vitis riparia	RIVERBANK GRAPE	1	

Wetland Section II. Wetland Section II is a small emergent wetland plant community situated on the inside bend of the creek meander. The wetland is located just downstream from the culvert

located on Orland Road. The stream is not channelized at this point of its reach. The wetland formed as stream-borne sediment was deposited in the slower moving waters on the inside of the stream bend (see Map 10-6 and Figure 10-4).

The soil substrate within the wetland was a thin layer of muck over layers of stratified sandy alluvium. The soil was saturated to the surface. The immediately adjacent uplands were mixed, mesic woodlands covering dome-shaped hills of sandy loam and loamy sand soils.

Due to the location of the wetland in proximity to constant disturbance (seasonal stream overflow and deposition of sediment), the emergent plant community was not diverse in number of species and was dominated by non-native, invasive plant species. The plant list for the emergent plant community within Wetland Section II follows:

Wetland Section II

Scientific Name	Common Name	C-value	Fen Indicator
ALLIARIA PETIOLATA	GARLIC MUSTARD		
Carex stipata v. stipata	COMMON FOX SEDGE	2	
Impatiens capensis	SPOTTED TOUCH-ME-NOT	2	
LAMIUM PURPUREUM	PURPLE DEAD NETTLE		
Lathyrus palustris	MARSH VETCHLING	7	
Onoclea sensibilis	SENSITIVE FERN	4	
Persicaria sagittata	ARROW-LEAVED TEAR-THUMB	4	
PHALARIS ARUNDINACEA	REED CANARY GRASS		
URTICA DIOICA s. DIOICA	TALL NETTLE		

Wetland Section III. Wetland Section III is a former stream meander with its associated flood plain. The former flood plain was isolated from the main channel during the construction of a former mill. A millpond dam was constructed to create a millpond. The meander and millpond were contained by an earthen embankment on the former upstream end of the meander. A channel was excavated through upland soils to by-pass the millpond. The former mill race below the former dam was also part of the original stream channel. The mill race has since been isolated from the main stream channel, also, by an earthen dam. The millpond no longer receives flow from the stream channel and has become vegetated with water-tolerant trees. The mill race no longer receives water flow from the millpond and has become vegetated with emergent and scrub wetland plant species (see Map 10-6 and Figure 10-5).

The soil substrate within the wetland was a thin layer of sandy muck over layers of stratified sandy alluvium. The soil was saturated to the surface. The immediately adjacent uplands were mixed, mesic woodlands covering dome-shaped hills of sandy loam and loamy sand soils. The wetland now receives water from groundwater discharge and storm water runoff from the surrounding uplands.

The plant list for the forested and scrub/emergent plant communities within Wetland Section III follows:

Wetland Section III

Scientific Name	Common Name	C-value	Fen Indicator
Acer negundo	BOXELDER	1	
Acer saccharinum	SILVER MAPLE	1	
Acer saccharum	SUGAR MAPLE	4	
ALLIARIA PETIOLATA	GARLIC MUSTARD		
Carex lacustris	COMMON LAKE SEDGE	7	
Carex stricta	COMMON TUSSOCK SEDGE	5	
Cephalanthus occidentalis	BUTTONBUSH	5	
Circaea lutetiana s. canadensis	ENCHANTER'S NIGHTSHADE	2	
Fraxinus pennsylvanica v. lanceolata	GREEN ASH	1	
Iris virginica	SOUTHERN BLUE FLAG	5	
Laportea canadensis	CANADA WOOD NETTLE	2	
Lindera benzoin	HAIRY SPICEBUSH	5	
LYSIMACHIA NUMMULARIA	MONEYWORT		
Onoclea sensibilis	SENSITIVE FERN	4	
PHALARIS ARUNDINACEA	REED CANARY GRASS		
Populus deltoides	EASTERN COTTONWOOD	1	
Ribes cynosbati	PRICKLY WILD GOOSEBERRY	4	
Thelypteris palustris v. pubescens	MARSH SHIELD FERN	7	
Toxicodendron radicans s. radicans	POISON IVY	1	
Ulmus americana	AMERICAN ELM	3	
Ulmus rubra	SLIPPERY ELM	3	
Viburnum lentago	NANNYBERRY	5	

10B.5 Floristic Quality Assessment

The Floristic Quality Assessment of the plant communities associated with each area serves as a baseline data set by which to monitor potential change within the communities over time. The

assessment also serves to objectify a determination as to whether or not the areas are considered high quality "natural areas".

The basis of the assessment is that native plants have adapted to or were designed to fit specific physical parameters found within their surroundings. The ecological tenant is that those plants that thrive under relatively stable environments over long periods of time will be self-replicating. Conversely, if the habitat changes rapidly, the plant species and composition will change thereby producing a plant community that is in flux. The assumption is that a stable plant community is ecologically more desirable and a better indicator of ecological health. The plants that are then associated with these stable communities (and are less adapted to sudden change) are called "conservative species". In this assessment, the degree to which an area supports conservative plant species is the goal.

Only native plants are given coefficients of conservatism (C-value). All native plants are given a coefficient of conservatism ranging from 0 to 10 (10 being the most conservative, the most likely to disappear following a disturbance, and the best indicator of a natural area). Non-native plants (indicated by scientific names in all capital letters in the above lists) are listed as indications of potential management concerns if the plant communities exhibit sudden change over a short period of time. A spread or increase in the area or number of non-native species will replace the conservative native species first. This change will be indicated by a decrease in the mean-*C* value or *I* value according to the following formulas:

$$\textbf{mean-}\boldsymbol{C}\textbf{ value} = \sum \text{ of all } C \text{ values/total number of natives (N)}$$

AND

$$\textbf{floristic quality index (}\boldsymbol{I}\textbf{)} = \text{ mean-}C \text{ value} \times \sqrt{\text{of the total number of natives (N)}}$$

According to Swink and Wilhelm (1994):

> In order to determine the extent to which a site preserves natural plant community quality, an inventory of relevant portions of the area is required. The Surveyor compiles as complete a plant inventory as possible, then calculates mean-*C* and *I* values. Generally, if the mean-*C* value for the site is 3.5 or higher or has n *I* value of 35 or more, one can be fairly confident that the site has sufficient floristic quality to be at least of marginal natural area quality. If the mean-*C* value is 4.5 or higher, or has an *I* value of 45 or more, then it is almost certain that the remnant has natural area potential.

For Wetland Section IA Lobe, forty-eight (48) native species were identified. The sum of the *C*-values was 246. Therefore, mean *C*-value was 5.1. The *I*-value was 35.5.

For Wetland Section IB Lobe, ten (10) native species were identified. The sum of the *C*-values was 37. Therefore, mean *C*-value was 3.7. The *I*-value was 11.7.

For Wetland Section IC Lobe, forty-three (43) native species were identified. The sum of the *C*-values was 202. Therefore, mean *C*-value was 4.7. The *I*-value was 30.8.

For Wetland Section II Lobe, five (5) native species were identified. The sum of the *C*-values was 19. Therefore, mean *C*-value was 3.8. The *I*-value was 8.5.

For Wetland Section III Lobe, nineteen (19) native species were identified. The sum of the *C*-values was 66. Therefore, mean *C*-value was 3.5. The *I*-value was 15.1.

10B.6 Wetland Community Types

Wetland Section I

Wetland Section I is a broad, lobed stream valley situated within and surrounded by glacially-deposited moraines and kames of sands and gravels. The hydrology of this area is likely driven by groundwater discharge from the adjacent porous hillsides, as well as, direct flow from the outlet of Crooked Lake. Since the flow from Crooked Lake is metered through a constructed spillway, it is likely that the discharge has a minor impact upon the wetland's hydrology compared to groundwater inputs. The area is hydraulically connected to Lake Gage via the stream channel. Excavated drainage channels imperfectly drain the larger lobes of the wetland, but do have an impact upon the reaches of the lobes closest to the stream channel. The Stream channel and adjacent flats are dominated by the invasive Reed Canary Grass (*Phalaris arundinacea*). The area at the uppermost end of the section was flooded previously through beaver activity, killing many of the Green Ash (*Fraxinus pennsylvanica*).

The lobes of the wetland are flat-to-very gently sloping toward the stream channel. Flowing water was observed moving toward the stream channel. The soil substrate for the valley bottom is muck.

The flatter areas of the lobes are dominated by trees and tall shrubs. It is likely that this area would be classified as a shrub carr. Herbaceous and some woody shrub species within the area are frequently found in sedge meadow, wet prairie, and fen wetland communities. Four species, Dwarf Birch (*Betula pumila*), Fen Thistle (*Cirsium muticum*), Shrubby Cinquefoil (*Dasiphora fruticosa s. floribunda*), and Rough-Leaved Goldenrod (*Solidago patula*) found in the area are considered "fen indicator species".

Due to the apparent slope of the area; its topographic position in relation to porous glacial formations; proximity to potential groundwater discharge points; muck soil substrate; observable groundwater flow; and dominant plant community members, including fen indicator species it is likely that the lobes of this wetland section would be classified as fen.

Wetland Section II

Wetland Section II is a small vegetated flat adjacent to the stream. The wetland is located downstream of Wetland Section I. The stream valley is narrow within its reach with steeply-sloped hillsides abutting the stream. The stream channel bottom is a mixture of sands and clean gravel. The streamside wetland is located on the inside bend of a stream meander. Emergent vegetation has colonized the alluvial deposits lain by seasonally fluctuating stream flow.

Though highly degraded and dominated by the non-native, invasive Reed Canary Grass (*Phalaris arundinacea*), the community would be classified as a sedge meadow.

Wetland Section III

Wetland Section III a highly disturbed area. The former stream meander has been isolated from the main stream channel by earthen embankments at its upstream and downstream ends. A concrete dam and spillway (now abandoned) was constructed within the former stream meander to for a millpond and mill race. And the ponded water settled fine sediments and organic matter over the original substrate.

No longer functioning, the mill site has converted to a relatively young plant community dominated by Cottonwood (*Populus deltoides*). In most of the wetland area, the forest floor is devoid of herbaceous vegetation. The community resembles a wet floodplain forest in character.

Even though the wetland section is located in close proximity to the inlet of Lake Gage, it no longer is hydrologically connected to the lake.

10B.7 Summary

The wetland complex identified as Wetland Sections I, II, and III found within this project is a good cross-representation of the type of landscape indicative of the Northern Lakes Natural Region (Homoya, 1985). The porous, glacial hills in close proximity to muck-substrate wetlands vegetated with a complex community of tall shrub thicket and sedge meadow is what identifies the lake country of northeast Indiana.

Based upon data collection and analysis, site observations, professional judgment, and comparisons with the Floristic Quality Assessment, portions of Wetland Section I (namely the upper reaches of Wetland Sections IA and IC) are worthy of classification as high quality natural areas. With a mean Coefficient of Conservatism value of 5.1 and 4.7, respectively and a Floristic Quality Index of 35.5 and 30.8, respectively the two areas are worthy of "high quality natural area" classification.

Furthermore, in Indiana, a wetland is classified as a Tier I or Tier II type wetland (327 IAC 2-1.8.4). Wetlands are classified as Tier I or Tier II based upon the wetland's sensitivity to disturbance, rarity, and potential to be adequately replaced by compensatory mitigation. Tier II wetlands are acid bogs, circumneutral bogs, cypress swamps, fens, dune and swale, muck flat, sinkhole pond, sinkhole swamp, sand flat, and marl beach. Tier II wetlands are considered of high natural and environmental value.

Based upon the uniqueness of these natural features, familiarity with this type of landscape type, professional judgment, and comparison with the draft wetland classification system (Draft Rule #99-58 under Title 327 of the Water Pollution Control Board), portions of the wetland complex would be classified as a Tier II wetland. In particular, the upper reaches of the lobes of Wetland Section IA and IC would be classified as a fen. According to the classification system, fens are considered Tier II wetlands.

Map 10-5 indicates the approximate extent of Tier I and Tier II wetlands within the project area.

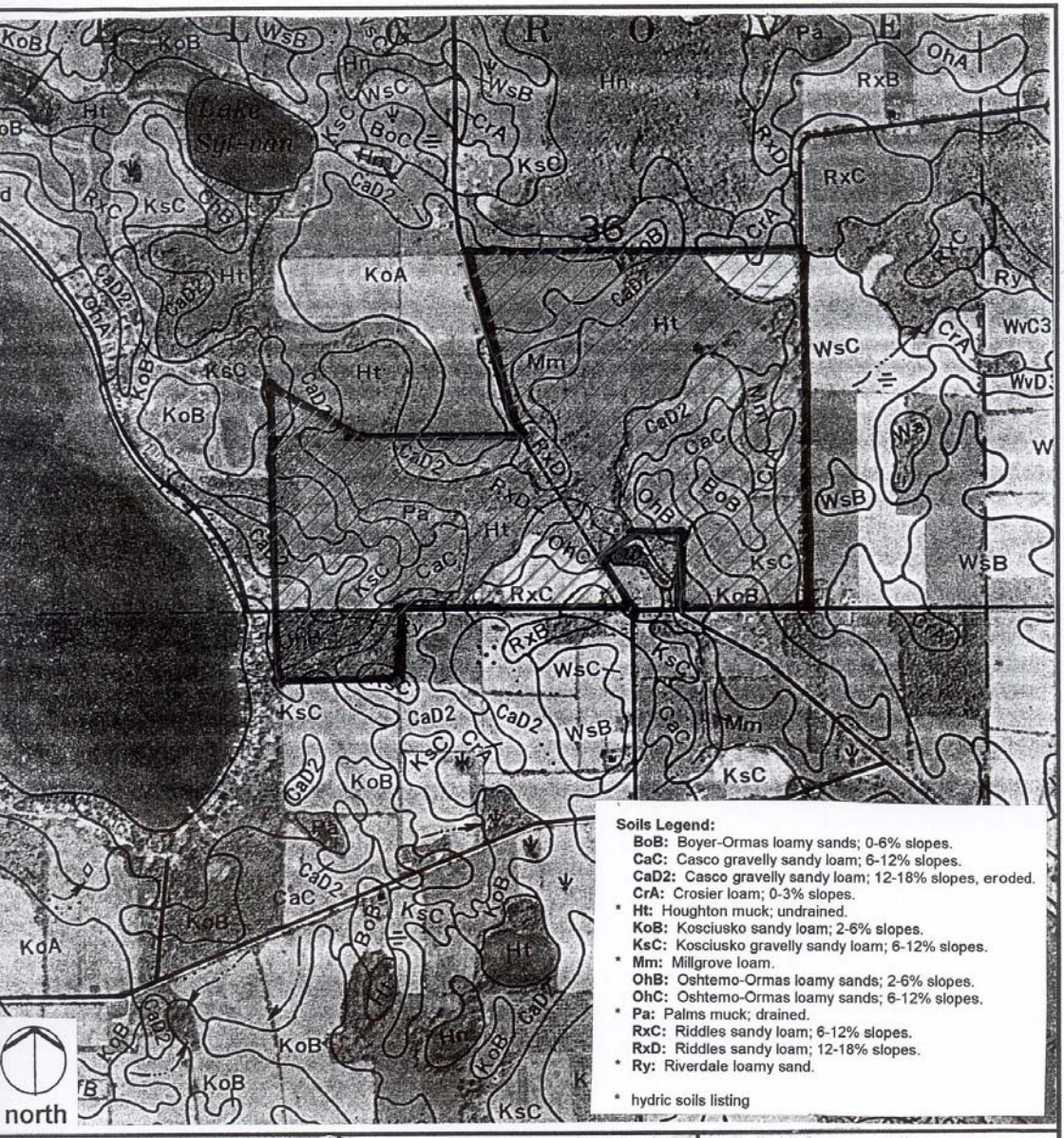
Impacts to the upper reaches of Wetland Sections IA and IC should be avoided when considering constructed engineering options to improve water quality within the watershed of Lake Gage and Lime Lake. Placement of fill material or alteration of the wetland hydrology (including placement of additional water upon the wetland surface) would negatively impact the high quality nature of the upper reaches of Wetland Sections IA and IC. Any proposed water control structures intended to raise water levels in the Wetland Section I should be sized so as not to flood the fen areas associated with the upper lobes of that Section.

It is further recommended that any proposed flooding of the degraded portions of Wetland Section I be preceded by vegetative control measures. The control measures should be aimed at removing the exotic and invasive Reed Canary Grass (*Phalaris arundinacea*) and Common Reed (*Phragmites australis*). Removal of these species would help reduce the risk of spread into the higher quality fen areas which would likely occur as a result of hydrology manipulation (see Map 10-5).

Based upon the degraded quality of the near-stream portions of Wetland Section I, the proposed activity of impounding water on the site would not have an adverse impact upon the wetland plant community. By contrast, eradication of invasive species and planting of native, submerged and emergent aquatic vegetation would increase the diversity of the wetland plant community.

Based upon the low quality and nature of the former millpond wetland plant community in Wetland Section III, the proposed activity of restoring the stream meander would potentially improve the quality of the wetland area. Planting shade tolerant, streamside emergent wetland vegetation as part of the restoration project would enhance the quality of the wetland plant community. The loss of a minimum number of tree species located in the former stream channel would be mitigated by improved hydrologic flow, increased vegetative diversity and improved wetland function and habitat.

Overall, the proposed engineering project would enhance existing wetland function and habitat by preserving high quality natural areas, improving existing wetland vegetation diversity, and diversifying wetland hydrology.



Soils Legend:

- **BoB:** Boyer-Ormas loamy sands; 0-6% slopes.
- **CaC:** Casco gravelly sandy loam; 6-12% slopes.
- **CaD2:** Casco gravelly sandy loam; 12-18% slopes, eroded.
- **CrA:** Crosier loam; 0-3% slopes.
- * **Ht:** Houghton muck; undrained.
- **KoB:** Kosciusko sandy loam; 2-6% slopes.
- **KsC:** Kosciusko gravelly sandy loam; 6-12% slopes.
- * **Mm:** Millgrove loam.
- **OhB:** Oshtemo-Ormas loamy sands; 2-6% slopes.
- **OhC:** Oshtemo-Ormas loamy sands; 6-12% slopes.
- * **Pa:** Palms muck; drained.
- **RxC:** Riddles sandy loam; 6-12% slopes.
- **RxD:** Riddles sandy loam; 12-18% slopes.
- * **Ry:** Riverdale loamy sand.

* hydric soils listing

ake and River
nhancement Project

pplicant:
ake Gage and Lime Lake Association, Inc.

onsultant:
ensic Engineering, Inc.
t. Wayne, Indiana

Association with:
quatic Enhancement & Survey, Inc.
lue Heron Ministries, Inc.

STEUBEN COUNTY SOIL SURVEY
(Map 10-1)

0 500 1000 2000 ft.

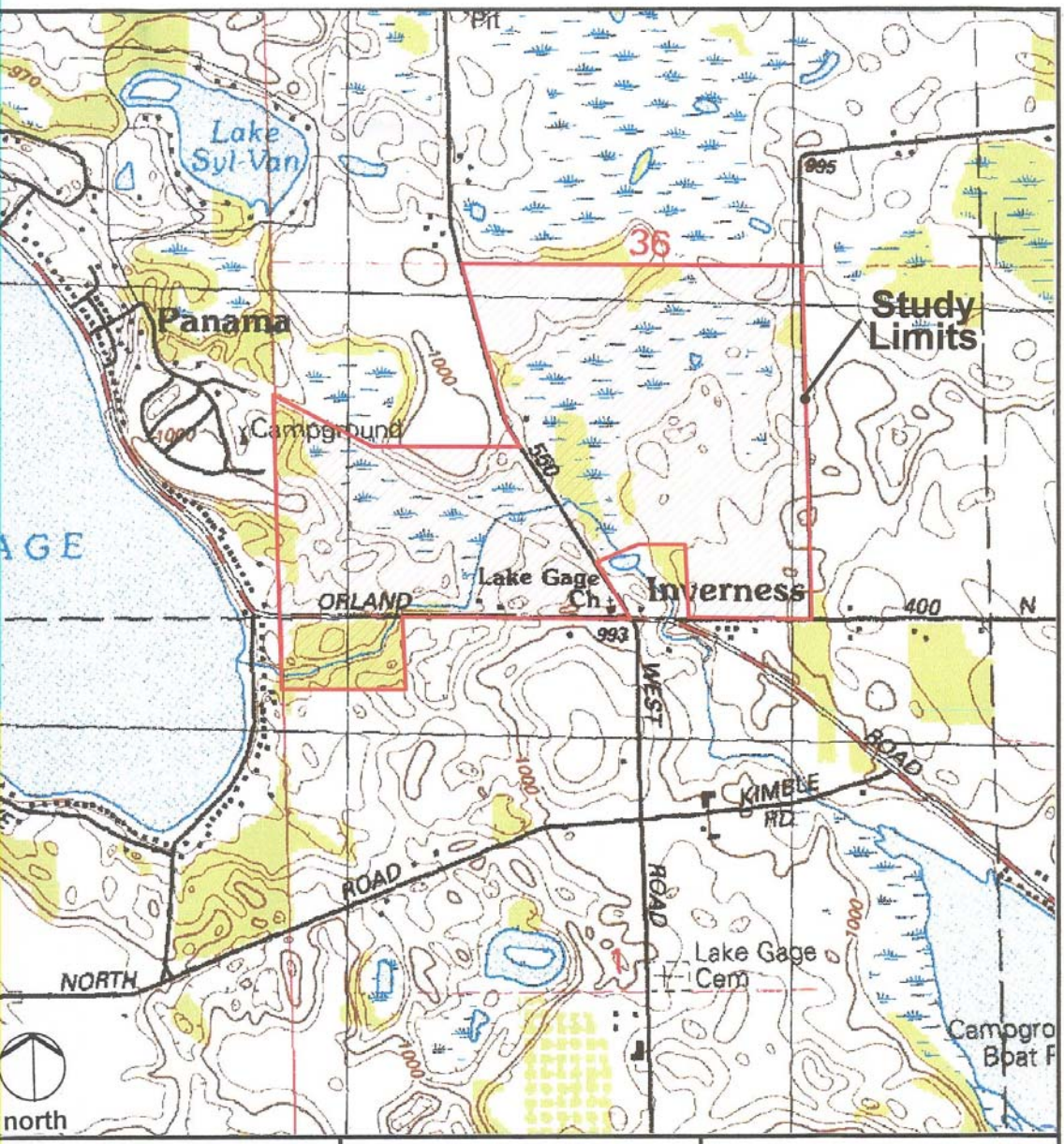
Lake Gage/Lime Lake
Engineering Feasibilty Study

Township: T37; Range: 12E; Section 36
Millgrove Township

Township: T38; Range: 12E; Section 1
Jackson Township

Angola West Quadrangle
Steuben County, Indiana

8/15/2005



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lue Heron Ministries, Inc.

USGS TOPOGRAPHIC SURVEY
(Map 10-2)

0 500 1000 2000 ft.

Lake Gage/Lime Lake
Engineering Feasibilty Study

Township: T37; Range: 12E; Section 36
Millgrove Township

Township: T38; Range: 12E; Section 1
Jackson Township

Angola West Quadrangle
Steuben County, Indiana

8/15/2005

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n Association with:
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lue Heron Ministries, Inc.

WETLAND DELINEATION
(Map 10-3)

0 250 500 1000 ft.

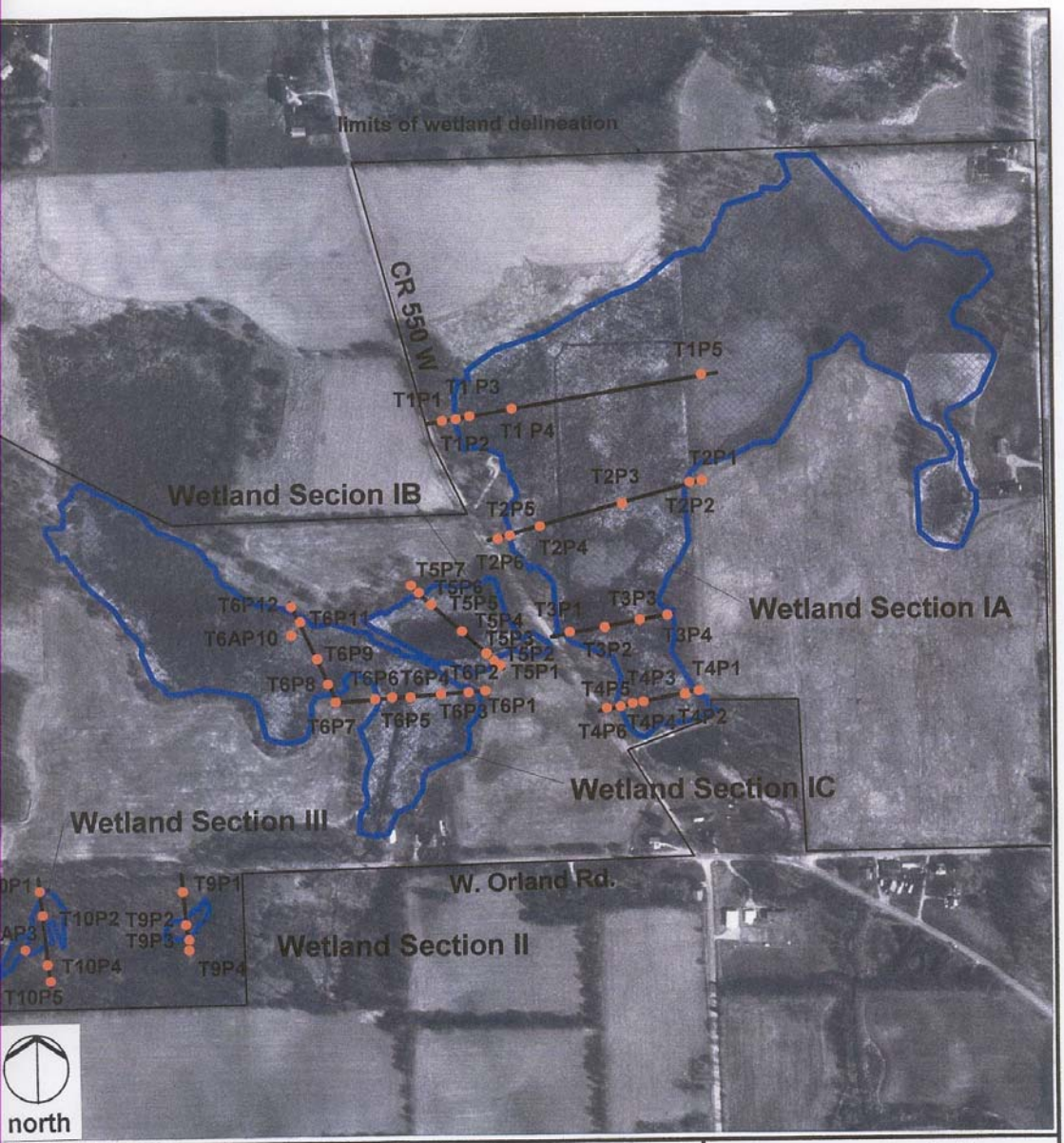
Lake Gage/Lime Lake
Engineering Feasibilty Study

Township: T37; Range: 12E; Section 36
Millgrove Township

Township: T38; Range: 12E; Section 1
Jackson Township

Angola West Quadrangle
Steuben County, Indiana

8/15/2005



Lake and River
Enhancement Project

Applicant:
Lake Gage and Lime Lake Association, Inc.

Consultant:
Gensic Engineering, Inc.
Ft. Wayne, Indiana

In Association with:
Aquatic Enhancement & Survey, Inc.
Blue Heron Ministries, Inc.

DELINEATION DATA POINTS
(Map 10-4)

0 250 500 1000 ft.

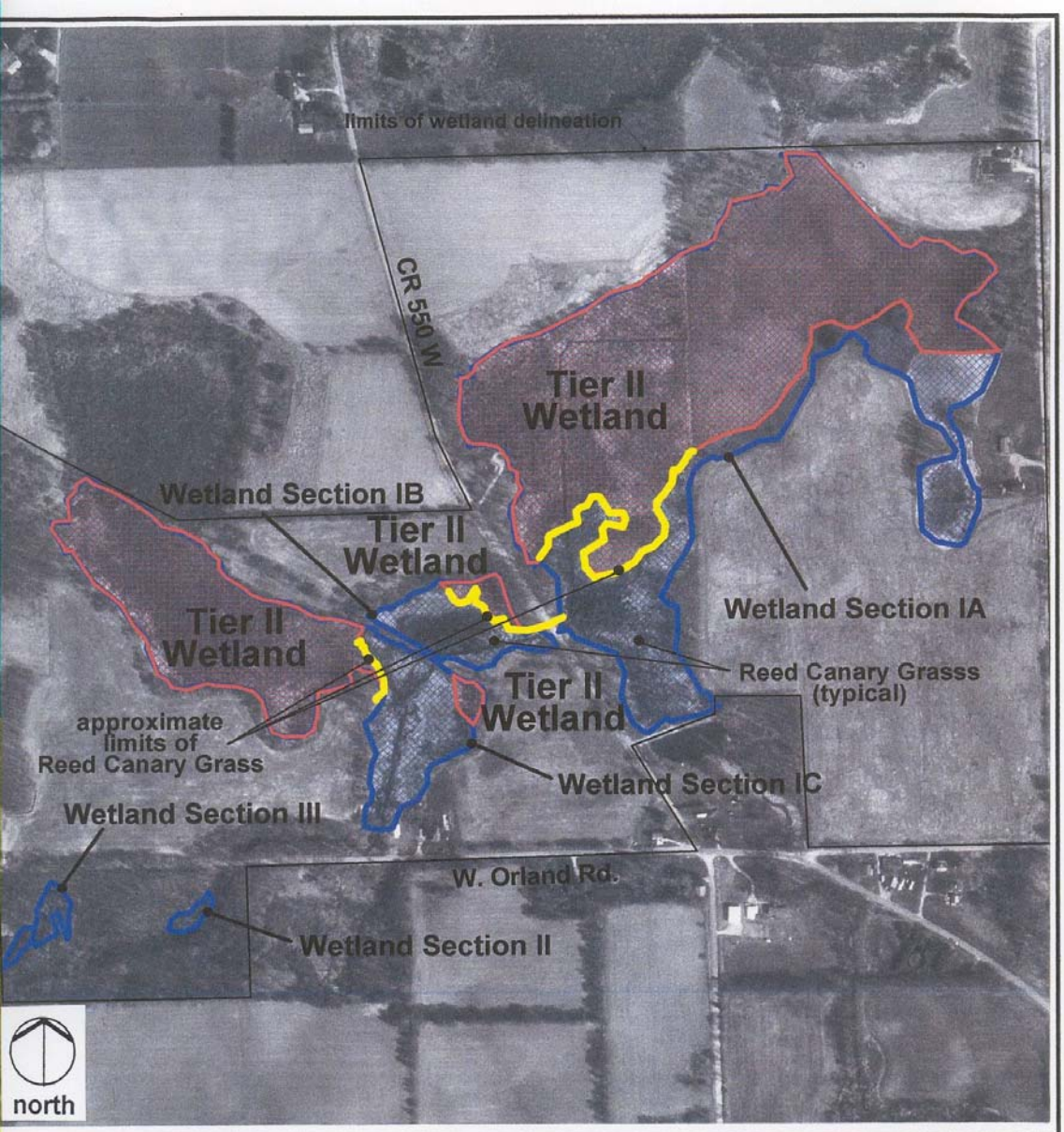
Lake Gage/Lime Lake
Engineering Feasibilty Study

Township: T37; Range: 12E; Section 36
Millgrove Township

Township: T38; Range: 12E; Section 1
Jackson Township

Angola West Quadrangle
Steuben County, Indiana

8/15/2005



Lake and River
Enhancement Project

Applicant:
Lake Gage and Lime Lake Association, Inc.

Consultant:
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Ft. Wayne, Indiana

In Association with:
Aquatic Enhancement & Survey, Inc.
Blue Heron Ministries, Inc.

TIER II WETLANDS
(Map 10-5)

0 250 500 1000 ft.

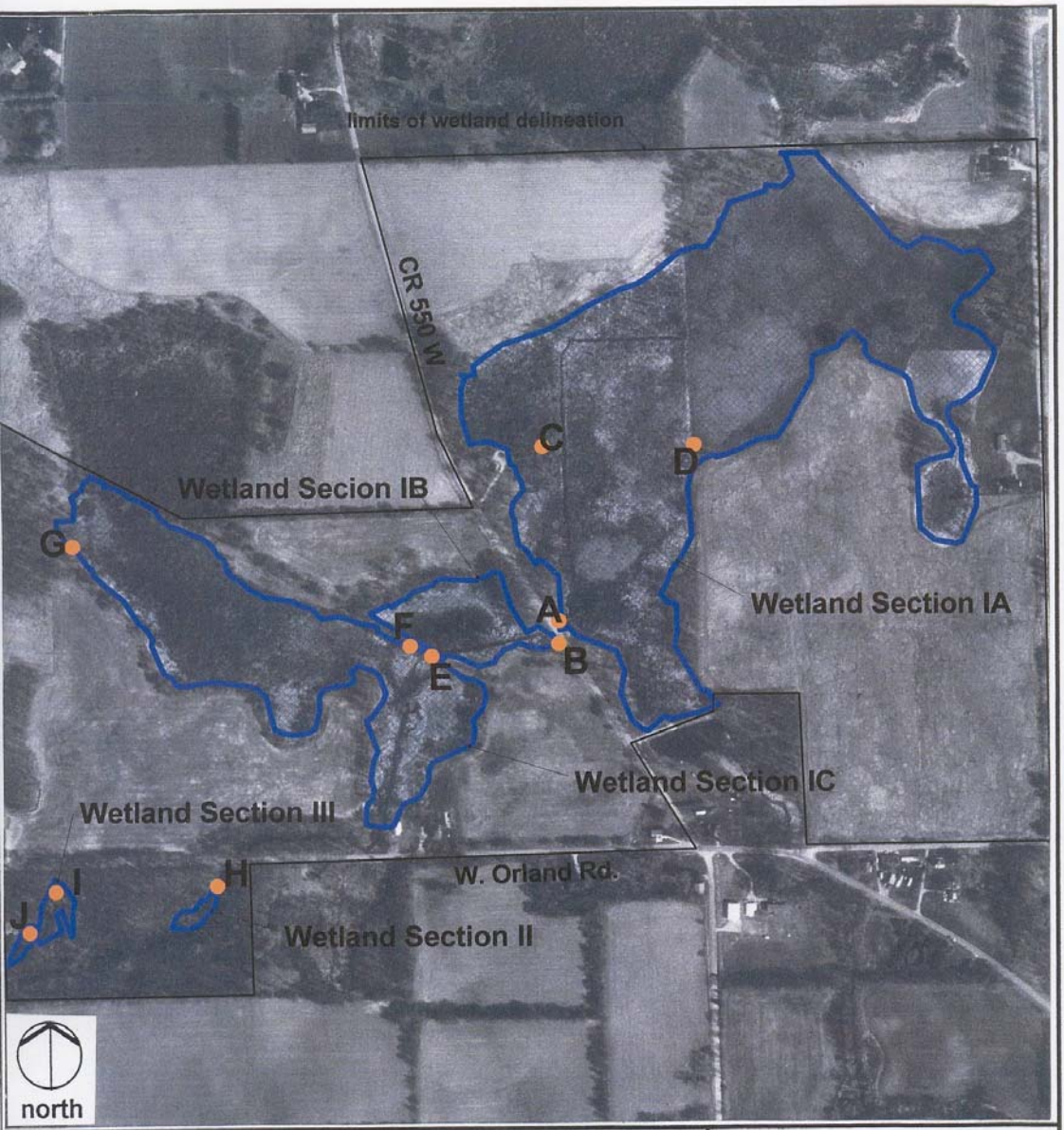
Lake Gage/Lime Lake
Engineering Feasibilty Study

Township: T37; Range: 12E; Section 36
Millgrove Township

Township: T38; Range: 12E; Section 1
Jackson Township

Angola West Quadrangle
Steuben County, Indiana

8/15/2005



Lake and River
Enhancement Project

Applicant:
Lake Gage and Lime Lake Association, Inc.

Consultant:
Gensic Engineering, Inc.
Ft. Wayne, Indiana

In Association with:
Aquatic Enhancement & Survey, Inc.
Blue Heron Ministries, Inc.

PHOTOGRAPH POINT LOCATIONS
(Map 10-6)

0 250 500 1000 ft.

Lake Gage/Lime Lake
Engineering Feasibilty Study

Township: T37; Range: 12E; Section 36
Millgrove Township

Township: T38; Range: 12E; Section 1
Jackson Township

Angola West Quadrangle
Steuben County, Indiana

8/15/2005

Photo Point A: View from CR 550 W at culvert; looking east into Wetland Section IA.

Photo Point B: View from CR 550 W at culvert; looking west into Wetland Section IB.

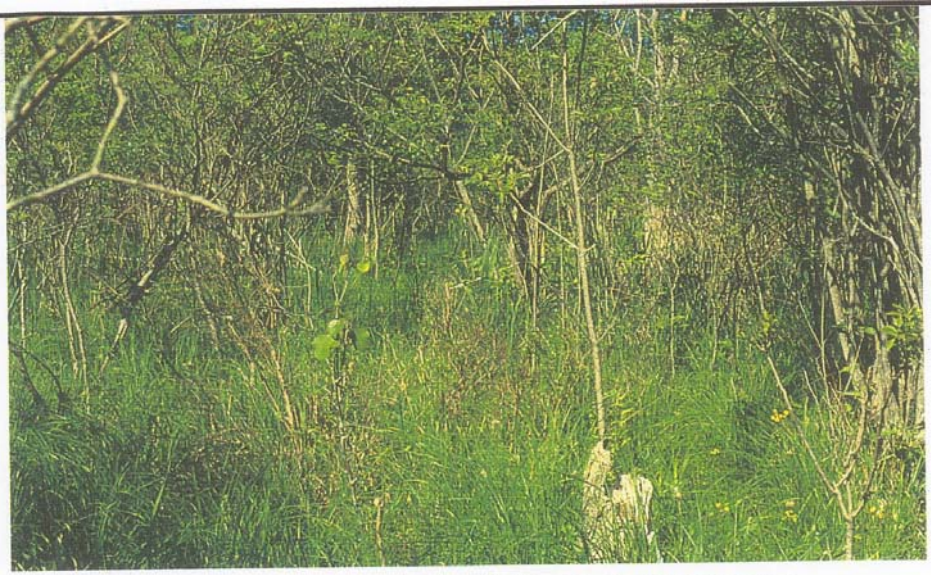


Photo Point C: View from interior of Wetland Section IA; looking west.

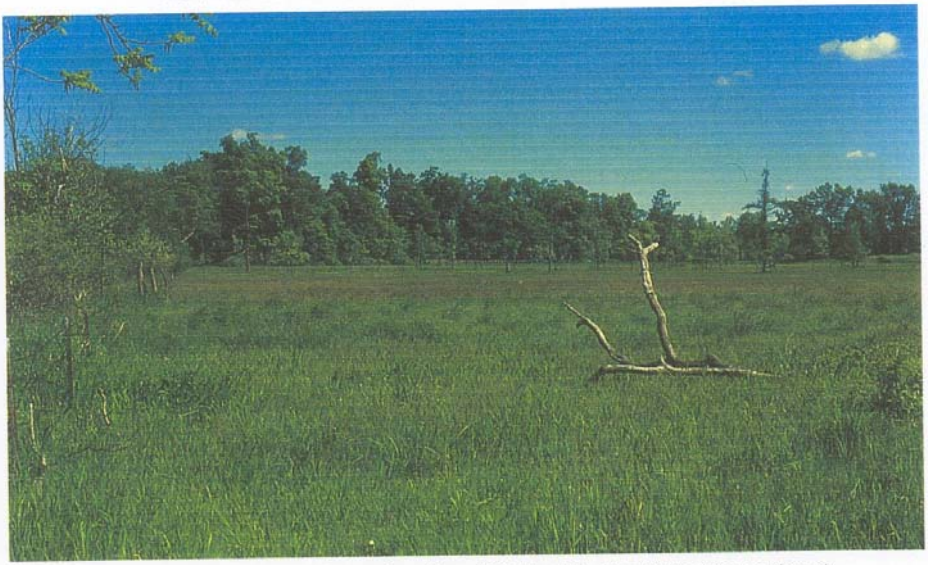


Photo Point D: View of grazed portion of Wetland Section IA; looking northeast.

Photo Point E: View from railroad grade; looking southeast into Wetland Section IC.

Photo Point F: View from railroad grade; looking northwest into Wetland Section IC.

Photo Point G: View into Wetland Section IC from northwest edge; looking southeast.

Photo Point H: View of Wetland Section II; looking downstream.

Photo Point I: View from interior of Wetland Section III; looking south west at former mill pond dam.

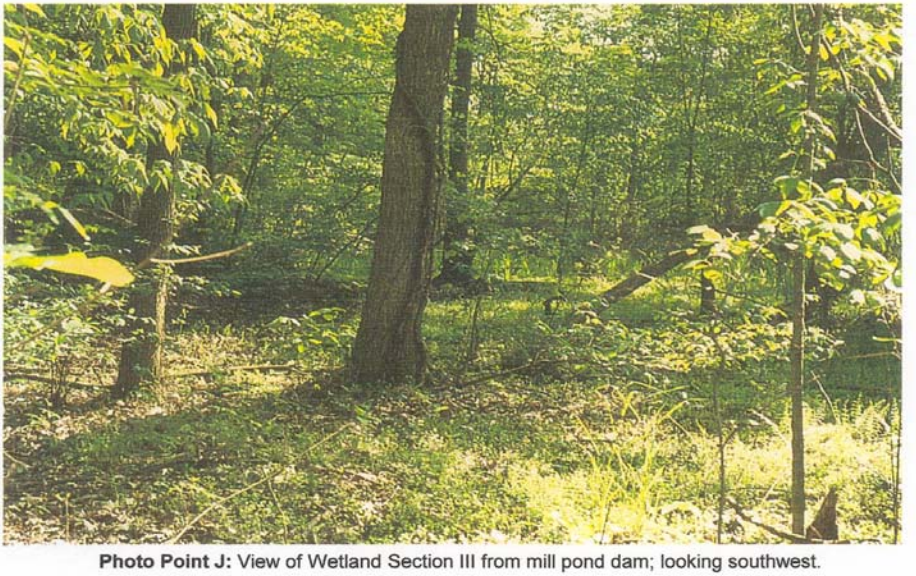


Photo Point J: View of Wetland Section III from mill pond dam; looking southwest.

11 Biological and Habitat Integrity In/Downstream of Proposed Project Sites

11.1 Introduction. Benthic Macroinvertebrate Sampling

Because the proposed wetland project area may cause changes in the stream's water quality, flow regime, substrate, etc. an assessment was made of benthic macroinvertebrates collected from the streambed on August 8th and 9th of 2005, just downstream of the project area. The primary purpose of the sampling and analysis is to establish baseline data for comparison with post project data. This also allows some degree of comparison with other Indiana streams where collection protocols are similar. Benthic macroinvertebrates include the various organisms living in the stream and on/in the streambed. Higher organisms with a spinal column are generally excluded although note was also made of fish species collected during the sampling. Measurement of benthic macroinvertebrate community composition can be a valuable aid in water quality assessment because benthic community composition generally reflects the health, stability, and general polluting influences a stream is subjected to. A streams water quality over time leaves a signature in its benthic community as various species of benthos with differing pollution tolerances and habitat requirements colonize the stream successfully or decline and are extirpated. Identification of invertebrates collected was used to calculate m-IBI (Macroinvertebrate Index of Biotic Integrity) See table 11-1. The index serves as a numeric score for the stream quality based on its invertebrate species assemblage. One site downstream of the Wetland Project Area and one site in the Stream Channel Restoration Area were sampled. One site upstream of both project areas was also sampled as a reference site (see map 11-1). Individual score sheets, drawings, and photos for the sampling sites are located in Appendix E.

11.2 Introduction. Qualitative Habitat Evaluation Index

Field observations of stream habitat characteristics were made for stream reaches at the three sampling sites in August of 2005. These observations were used to score the stream sites in the QHEI (Qualitative Habitat Evaluation Index). This produces a numeric score for the observed stream section (reach), based on observable qualitative habitat characteristics. In this work the primary purpose of QHEI scoring is also to establish baseline data for comparison with post-project habitat quality. Individual score sheets, drawings, and photos for the sampling sites are located in Appendix E.

11.3 Methods

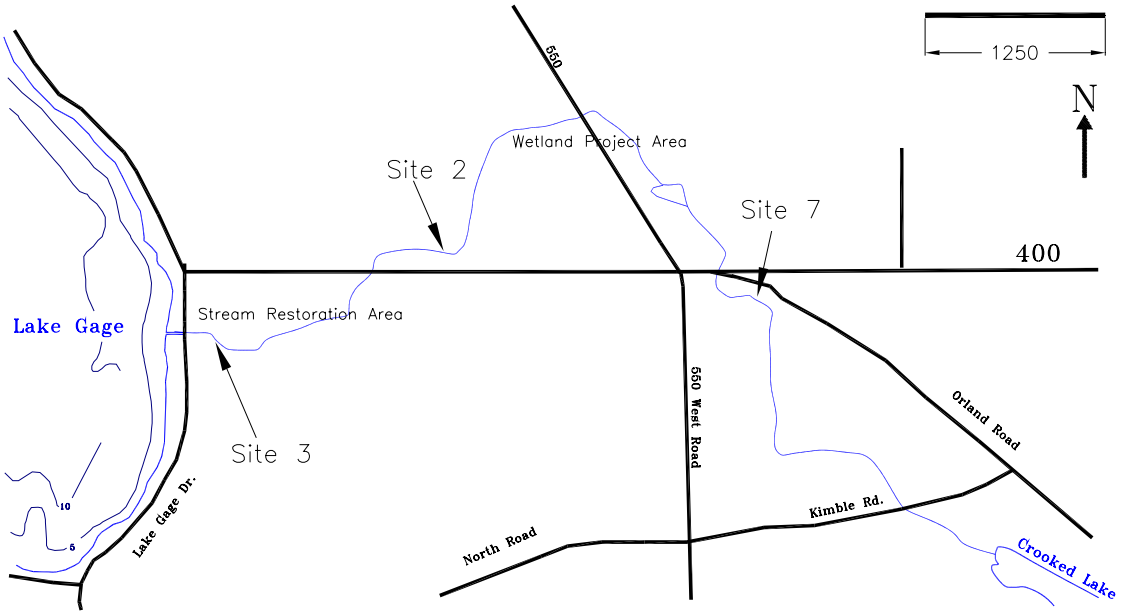
All m-IBI and QHEI score calculation, and benthic macroinvertebrate identification and preservation was performed by Inter-fluve, Inc. Assistance was provided by Inter-fluve, Inc. on all invertebrate collection and QHEI field observation.

Detailed information about each site and the field methods used can be found in Appendix E along with the data. All samples were collected using EPA Rapid Bioassesment protocols for Wadeable Streams. A 500 micron net was used for kick sampling at riffles. At each site a Qualitative Habitat Evaluation Index was performed, based on IDEM protocol.

Each sample was preserved in a mixture of 80% alcohol and brought back to the lab for identification. All samples were identified to family level, and vouchers of each were saved

in separate vials for curation. A 15 minute pick was also performed on the sample, in keeping with IDEM protocols, and preserved for curation.

The m-IBI is calculated based on Indiana specific metrics and scores developed by IDEM for riffle kick samples. A table illustrating the metrics is shown below. (table 11-1) Each metric receives a score and then they are averaged for a possible 0 (lowest) to the highest possible score of 8. (2005 Inter-Fluve Inc.)



Map 11-1 stream benthic macroinvertebrate collection / QHEI scoring sites

Table 11-1 Scoring Criteria for the Family Level Macroinvertebrate Index of Biotic Integrity (mIBI) for Riffle KICK Samples. Calibrated from Transformed Data Distribution of the 1990-1995 sampling using 100-Organism Subsamples (IDEM- BSS Section)

	Classification Scores				
	0	**2**	**4**	**6**	**8**
Family Level HBI	≥ 5.63	5.06 - 5.62	4.55 - 5.05	4.09 - 4.54	≤ 4.08
Number of Taxa	≤ 7	8-10	11-14	15-17	≥ 18
Number of Individuals	≤ 79	80-129	130-212	213-349	≥ 350
Percent Dominant Taxa	≥ 61.6	43.9-61.5	31.2-43.8	22.2-31.1	≤ 22.1
EPT Index	≤ 2	3	4-5	6-7	≥ 8
EPT Count	≤ 19	20-42	43-91	92-194	≥ 195
EPT Count to Total Number of Individuals	≤ 0.13	0.14-0.29	0.30-0.46	0.47-0.68	≥ 0.69
EPT Count to Chironomid Count	≤ 0.88	0.89-2.55	2.56-5.70	5.71- 11.65	≥ 11.66
Chironomid Count	≥ 147	55-146	20-54	7-9	≤ 6
Total Number of Individuals to Number of Squares Sorted	≤ 29	30-71	72-171	172-409	≥ 410

Stream Name	Location	QHEI Score (100 possible)	m-IBI Score (8 possible)
Pigeon Creek	CR 400 S	63	4.6
Black Creek	SR 1	55	3.2
Pigeon Creek	D/S SR 27 Bridge	72	3.4
Eaton Creek	D/S CR 100 E	41	3.2
Crooked Creek	D/S Nevada Mills Dam	76	3.6
Pigeon Creek	SR 327 DNR Access	46	2.8
Turkey Creek	SR 327	52	2.2
Fish Creek	CR 40 S	62	4.4
Black Creek	SR 1	69	4.2
Fish Creek No 2	CR 775 S	53	5.6
Concorde Creek	Site 2, Orland Rd	69.5	3.6
Concorde Creek	Site 3, Butler-Symonik woods	58	5.4
Concorde Creek	Site 7 (ref. reach)	65.25	1.8

Table 11-2

11.4 Results

Table 11-2 contains scoring results for the Concorde Creek sites sampled. While the scores produced serve mainly as baseline data to help gage the effects of the projects, a rough comparison can be made to other stream sites in Steuben County in the table above. The Orland Road site (site 2) had the highest QHEI score of the three sites sampled and the second highest m-IBI score. One possible post project positive influence on this stream reach could include a decrease in sediment load and nutrient levels during spring and summer rain events. One possible negative influence may include an increase in summer water temperatures as groundwater flowing through the upstream streambed is warmed in the pooled area of the wetland. Post project sampling should be performed to assess project impacts. Site 3 in the stream restoration project area had the second highest QHEI score and the highest m-IBI score. The potential for the project to affect habitat and biological integrity is great in this area because the entire stream will be relocated by the project. It will be important for the stream restoration project design to consider this and set a goal of matching or surpassing these scores in post-project sampling.

12 Early Coordination

12.1 Attendance

An early coordination meeting was held on January 27, 2005. The following attendees field checked potential construction areas:

Steve Sprecher, United states Army Corps of Engineers
Elizabeth McCloskey, United States Fish and Wildlife Service
Keith Pool, Indiana Department of Natural Resources - Division of Fish and Wildlife
Neil Ledet, Indiana Department of Natural Resources - Division of Fish and Wildlife
Kent Tracy, Indiana Department of Natural Resources - Division of Soil Conservation
Larry Gilbert, Steuben County Surveyor
Joe Weaver, Lake Gage and Lime Lake Association
Scott Banfield, Aquatic Enhancement and Surveying, Inc.
Michael Gensic, Gensic Engineering Inc.

Ryan Cassidy, Indiana Department of Environmental Management - Office of Water Quality visited the proposed construction areas on July 7, 2005.

12.2 General Comments

Public agency representatives were generally favorable toward the proposed project. Several agencies agreed that the wetland water control project and the stream channel restoration project should be treated and permitted as separate projects to prevent the possibility of delaying one project due to comments on the other. Early coordination comments were considered in preparing the preliminary construction design for the feasibility study. Written comments are included in the appendices of this report.

13. Potential Sources for Project Funding and Technical Assistance

Sources of funding and technical assistance in implementing the proposed project may include:

Indiana Department of Natural Resources
Division of Fish and Wildlife
402 W. Washington Street
Indianapolis, IN 46204-2739
317-233-5468

Ducks Unlimited
Great Lakes/Atlantic Regional Office
331 Metty Drive, Suite #4,
Ann Arbor, MI 48103
734-623-2000

USDA Natural Resources Conservation Service
1220 N 200W
Angola, IN 46703

Wood-Land-Lakes RC&D
Peachtree Plaza 200
1220 N 200 W –Suite J
Angola, IN 46703
260-665-3211, ext. 5

APPENDIX A

EARLY COORDINATION CORRESPONDENCE

DEPARTMENT OF THE ARMY
DETROIT DISTRICT, CORPS OF ENGINEERS
REGULATORY OFFICE
SOUTH BEND FIELD OFFICE
2422 VIRIDIAN DRIVE SUITE # 101
SOUTH BEND, INDIANA 46628

January 28, 2005

IN REPLY REFER TO

File No. 04-176-047-0

Gensic Engineering, Inc
311 Airport North Office Park
Fort Wayne, Indiana 46825

Dear Mr. Gensic:

This is in response to your request for a list of permitting issues the US Army Corps of Engineers may evaluate if you should apply for authorization to alter the hydrology in the drainage system between Lake Gage and Crooked Lake in Steuben County, Indiana (Section 1, Township 37 N, Range 12 E; and Section 27, Township 38 N, Range 12 E).

We discussed numerous issues during the on-site pre-application meeting that you convened on January 27, 2005. From the information you supplied it seems likely that your project will not qualify for Nationwide Permit 27, wetland restoration, because of the acreage of wetlands that will be inundated.

The Corps' responsibility is to assure that the functions and values of the Nation's aquatic resources not be degraded by your project, and that the project comply with the National Environmental Policy Act (NEPA). If your project requires evaluation as an individual permit, we will review and/or assess the following information/factors:

1. A wetland delineation of existing conditions.
2. Any analysis you submit regarding possible causes of the degradation in fish habitat in Lake Gage. At the pre-application meeting we did not see the data you used to identify the cause of the problem. In other words, is your project going to solve the downstream lacustrine habitat problem?
3. Any alternatives to the project that have less impact to existing wetlands.
4. Direct impacts, including the footprint of any dams, riprap, weirs, etc., of the project to waters under our jurisdiction.
5. Indirect impacts, including a modeled estimate of the areal extent of inundation at different frequency intervals, depths, and months of the year when anticipated.
6. The following wetland functions and values
    a. groundwater recharge/discharge
    b. floodflow alteration
    c. fish and shellfish habitat

d. sediment/toxicant/pathogen retention
e. nutrient removal/retention/'transformation
f. export of nutrients and food
g. sediment/shoreline stabilization
h. wildlife habitat
i. recreation
j. educational/scientific value
k. uniqueness/heritage
l. visual quality/aesthetics
m. threatened or endangered species.

7. An evaluation of project impacts on the following public interest review factors:
   a. conservation
   b. economics
   c. aethetics
   d. historic properties
   e. land use
   f. navigation
   g. recreation
   h. energy needs
   i. mineral needs
   j. safety
   k. water quality
   l. general environmental concerns
   m. considerations of property ownership
   n. needs and welfare of the people

The above lists are not exhaustive. Some of the items may not be directly applicable to your specific project. Any information that you provide on these items will help us process your application.

From the information you provided at our onsite meeting it seems likely that you will require a Corps permit for the discharge of dredged or fill material into waters of the United States including adjacent wetlands. The authority of the Corps of Engineers to regulate the discharge of dredged and/or fill material is contained in Section 404 of the Clean Water Act and regulations promulgated pursuant to that Act. Filling and grading work, mechanized landclearing, the sidecasting of excavated material, and some forms of piling installation constitute or otherwise involve discharges of dredged and/or fill material under the Corps' regulatory authority.

If you anticipate any work lakeward of the Ordinary High Water Mark (OHWM) of Crooked Lake, Lake Gage, or the connecting ditches/streams, including adjacent wetlands regardless of elevation, please complete and submit our Application for Department of the Army Permit (ENG FORM 4345, July 97). Plan view and cross-sectional view drawings, in 8 1/2 inch x 11 inch format, should accompany the application. Drawings and a narrative on the form should specifically identify and describe all of the structures, work, and discharges which we regulate as described above, including temporary or construction measures.

The decision whether to issue a Corps permit will be based on an evaluation of the probable impacts, including cumulative impacts, of the proposed activity and its intended use on the public interest. Evaluation of the probable impact which the proposed activity may have on the public interest requires that we carefully weigh all those factors which become relevant in that particular case. The benefits which reasonably may be expected to accrue must be balanced against the reasonably foreseeable detriments. Subject to these criteria and any other relevant guidelines, we will grant a permit unless we determine that it would be contrary to the public interest.

Should you have any questions, please contact Steven W. Sprecher at the above address or telephone (574) 232-1952. Please refer to File Number: 04-176-047-0.

Sincerely,

Steven W. Sprecher
Project Manager
South Bend Field Office

United States Department of the Interior
Fish and Wildlife Service

Bloomington Field Office (ES)
620 South Walker Street
Bloomington, IN 47403-2121
Phone: (812) 334-4261 Fax: (812) 334-4273

February 11, 2005

Mr. Michael Gensic
Gensic Engineering Inc.
311 Airport North Office Park
Fort Wayne, Indiana 46825

Project: Lake Gage and Lime Lake Lake and River Enhancement Engineering Feasibility Study
Waterway: Outlet stream of Crooked Lake
Location: Between Crooked Lake and Lake Gage, Steuben County

Dear Mr. Gensic:

This responds to your letter dated December 10, 2004, concerning the aforementioned project. It also provides the preliminary comments of the U.S. Fish and Wildlife Service (FWS) on the proposal based upon the multi-agency site inspection held on January 27, 2005.

These comments have been prepared under the authority of the Fish and Wildlife Coordination Act (16 U.S.C. 661 et. seq.) and are consistent with the intent of the National Environmental Policy Act of 1969, the Endangered Species Act of 1973, and the U. S. Fish and Wildlife Service's Mitigation Policy.

On January 27, 2005, staff from the FWS, U.S. Army Corps of Engineers, Indiana Department of Natural Resources, Stueben County Surveyors Office, the local lake association, and your office met on-site to discuss possible projects to address water quality concerns at Lake Gage. It was indicated that there was a major algae bloom in Lake Gage in 2000 after a period of drought, and it is believed that nutrients stored in wetlands between Crooked Lake and Lake Gage were released during subsequent heavy rains. Although the stream was running high at the time of the site visit, it was pointed out that it is often dry, depending upon releases from Crooked Lake upstream.

Lake Gage has a maximum depth of 70 feet and very good water quality and is therefore able to sustain a population of cisco (Coregonus artedii), an Indiana species of special concern. Cisco require cold, well-oxygenated water for survival; because of degraded water quality in numerous Indiana lakes due to development pressures, this species has been eliminated from many lakes where it once was common. The Gage Lake Association is therefore proposing a LARE project to prevent a reoccurrence of algae blooms or other water quality problems.

Two types of projects were reviewed during the on-site meeting. The first involved a proposal to construct 3 water control structures to increase water level elevations within existing wetlands along the outlet stream from Crooked Lake. These would be in the vicinity of County Road 550 West, which is within the central portion of the stream length. This area is downstream of a private dam which impounds the creek near the intersection of Orland Road and CR 550W.

Upstream from CR 550W there are 2 large basins of wetlands partially drained by a lateral of the outlet stream. It was reported that there are springs within the wetland basins which provide water even when the Crooked Lake outlet stream is dry. The excavated lateral joins the outlet stream within the wetland complex just upstream of the culvert under CR 550W. There is a high road embankment here, but it is not considered feasible to use it as the control structure because of safety concerns. Therefore, some other type of structure, such as steel sheet piling, may be used. A design for a controlled outlet has not been determined. The wetland vegetation in the immediate vicinity of the culvert and junction of the 2 streams is primarily reed canary grass and dead trees due to previous flooding by beaver dams at the site. Upstream along the lateral and beyond it in the second wetland basin to the north, however, are forested/scrub shrub wetlands reported to support tamarack. It was reported that there is also a sedge meadow that is currently being grazed.

Downstream from CR 550W is an approximate 5 acre wetland basin separated from additional wetlands downstream by an old abandoned railroad embankment. This basin is dominated by reed canary grass, with a small patch of common reed and a few meanders from an old channel. It is proposed to put some type of water control structure within the opening of the old railroad embankment.

It is proposed to construct a third control structure several hundred feet downstream of the old railroad grade. We were not able to observe this site; however, it was indicated that considerable construction would be required to place a dam at this site because of the width of the existing valley, which is wetland primarily supporting reed canary grass.

The FWS believes that the most appropriate and least environmentally damaging site for a water control structure is the old railroad crossing. As discussed at the site visit, it may be possible to raise the water elevation to fill the basin and also back up water under CR 550W. Elevations of the existing stream and wetlands have not yet been determined, nor have potential elevations in a new flooded basin. We have significant concerns about flooding out high quality wetlands upstream from CR 550W if a separate structure is placed in that area. We also have significant concerns about movement of reptiles and amphibians and other small wildlife species back and forth over a new dam structure. Steel sheet piling upstream from CR 550W would block such movement. An outlet structure at the old railroad embankment could be designed to have much less of an adverse impact on these species, however, such as having long sloping gradients on the sides that would allow these species to move in both directions over the structure. Since the rest of the basin is already blocked by the railroad embankment, the stream opening is the only area allowing passage of such species. We do not support the construction of a third basin downstream of the railroad embankment because of the amount of wetland fill that would be required. A properly designed structure at the railroad embankment should be able to provide adequate water control to address the majority of the nutrient flushing concerns since it would control the vast majority of the watershed.

The second component of the project currently being proposed is the restoration of a segment of natural channel just upstream from Lake Gage. At one time there was a saw mill in this area, and the natural channel was dammed and converted into a small mill pond. The current stream channel was later excavated through upland around the

south side of the old channel and mill pond. Because of the steep banks along this excavated channel, there is severe bank erosion. The old dam structure remains in the now dry old channel/mill pond, and there is an earthen plug at its upstream end where the flow is diverted into the current channel. The proposal is to somehow return the flow to the original channel.

The meeting participants discussed this proposal at length, and it was recommended that it be considered entirely separate from the wetland construction/restoration project upstream rather than proposing a combined project. This is because considerably more evaluation of the desirability and feasibility of this channel restoration will be required. These include elevation differences at the upstream end of the old channel, whether or not a meandering channel should/could be excavated within the old mill pond or whether or not the water should be allowed to create its own channel, whether or not the current channel should be retained to carry high flows or blocked and/or filled, and whether or not additional work would be required in the area of the culverted road crossing immediately upstream of Lake Gage. Of particular concern is the possible flushing of sediments from behind the old dam into the lake, which is only 100 or so feet away.

At this time the FWS does not have specific comments about the feasibility or desirability of restoring the old stream channel because there is not enough information available on possible project impacts. We support considering it as a separate project from the wetland project.

ENDANGERED SPECIES

The proposed project is within the range of the Federally endangered Indiana bat (Myotis sodalis) and the threatened bald eagle (Haliaeetus leucocephalus) and northern copperbelly water snake (Nerodia erythrogaster neglecta). Indiana bats spend winters hibernating in select caves in Indiana, Kentucky, Missouri, and several other states. Summer habitat primarily consists of woodlands, with floodplains and riparian forests, including those along both rivers and lakes, being considered the most valuable habitats. Maternity colonies occupy roost sites in forested floodplain or upland habitats and are very loyal to their roosts and nightly foraging areas, which are usually centered over riparian forests. We have no information about the presence or absence of Indiana bats in the general project area; however, the area where the wetland restoration/construction is proposed does not provide suitable habitat for this species. Bald eagles area occasional visitors to the northern lakes region of Indiana, particularly during winter. However, they do not currently nest in the area and there is no specific habitat available for them in the proposed project area. The northern copperbelly is known from northeastern Steuben County and has not been reported to be present in the proposed project area. Therefore, the proposed project is not likely to adversely affect these endangered and threatened species.

The proposed project is also within the range of the eastern massasauga rattlesnake (Sistrurus catenatus catenatus), which has been listed as a Candidate for possible future listing as either threatened or endangered. Candidate species are those for which sufficient information on their biological status exists to warrant listing, but for which listing has not yet occurred. This species is known from several locations in Steuben County, and it may be present within the large wetland basins along the lateral upstream from CR 500W. We have no specific information about these wetlands, but general descriptions of their habitats appear to be appropriate for the eastern massasauga. Depending upon possible impacts to this wetland complex, we may request that surveys for this species be conducted in order to ensure that it is not harmed by the project.

We appreciate the opportunity to comment at this early stage of project planning. Please continue to coordinate with us as the project progresses. For further discussion, please contact Elizabeth McCloskey at (219) 983-9753 or elizabeth_mccloskey@fws.gov.

Sincerely yours,

Elizabeth S. McCloskey Acting

for Scott E. Pruitt
Supervisor

cc: Steve Sprecher, USCOE, South Bend Field Office, South Bend, IN
Christie Kiefer, Environmental Coordinator, Division of Water, Indianapolis, IN
Keith Poole, Indiana Division of Fish and Wildlife, Peru, IN
Neil Ledet, Indiana Division of Fish and Wildlife, Orland, IN
Ryan Cassidy, IDEM, Office of Water Management, Indianapolis, IN

Mitchell E. Daniels, Jr., Governor

DNR Indiana Department of Natural Resources

Division of Historic Preservation & Archaeology • 402 W. Washington Street, W274 • Indianapolis, IN 46204-2739
Phone 317-232-1646 • Fax 317-232-0693 • dhpa@dnr.IN.gov

February 9, 2005

Christie Kiefer
Indiana Department of
Natural Resources
Division of Water
402 West Washington, W264
Indianapolis, IN 46204-2641

State Agency: Indiana Department of Natural Resources, Division of Soil Conservation

Re: Construction of weirs and channel outlets to restore water levels at three wetland locations along the watercourse between Crooked Lake and the inlet at Lake Gage (DNR #11294)

Dear Ms. Kiefer:

Pursuant to Indiana Code 14-21-1-18 the Indiana Department of Natural Resources, Division of Historic Preservation and Archaeology ("DHPA") has conducted a review of the materials dated December 10, 2004, and received by the DHPA on December 28, 2004, for the above indicated project in Millgrove and Jackson townships, Steuben County, Indiana.

Based on our analysis, it has been determined that no historic structures will be altered, demolished, or removed by the proposed project.

As far as archaeology is concerned, an archaeological site (12-Sn-173) is recorded within the wetland restoration area. Please be advised that further archaeological investigations or avoidance is necessary regarding this site (see enclosed map of site location). Archaeological site locations should be kept confidential. If an archaeological investigation is conducted, it must be in accordance with IC 14-21-1 and 312 IAC 21 (see enclosed list of qualified archaeological contractors).

If you have any further questions regarding this determination, please contact our office at (317) 232-1646. Questions about archaeological issues should be directed to Dr. Rick Jones or Cathy Draeger. Questions about buildings and structures may be addressed to Shana Kelso.

Very truly yours,

for J. R. Jones III
Jon C. Smith
Deputy State Historic Preservation Officer

JCS:SNK:CLD:JRJ:cld

Enclosures (2)

emc: Kent Tracey, Division of Soil Conservation, Indiana Department of Natural Resources

DNR
Indiana Department of Natural Resources

Archaeologists
Qualified Professional List

HISTORIC PRESERVATION AND ARCHAEOLOGY

According to federal regulations, an archaeologist who undertakes or supervises archaeological investigations must meet minimun professional qualifications established by the Department of the Interior. The following individuals and institutions meet th Department of the Interior requirements for archaeological work (an * denotes institutions which hold archaeological records):

Allied Archaeology
Aurora, Illinois
Douglas Kullen, Senior Archaeologist
708-896-9375

AMEC Earth & Environmental
Louisville, KY
Anne T. Bader, Senior Archaeologist
502-267-0700

Applied Archaeological Services
Columbus, Ohio
614-299-0830

Archaeological Consultants of Ossian
P.O. Box 2374
Muncie, Indiana 47307
Larry Stillwell
765-730-0524

Archaeological Consultants of
the Midwest, Inc.
Indianapolis, IN
317 862-2002

*Archaeological Resources
Management Service
Ball State University
Muncie, Indiana
Donald R. Cochran, Director
765-285-5328

ASC Group, Inc.
Columbus, Ohio
Shaune Skinner, President
614-268-2514

Archaeological Research, Inc.
Chicago, Illinois
David Keene, CEO
773-384-8134

Archaeological and Historical
Consultants, Inc.
Centre Hall, Pennsylvania 16828
David Rue, Sr. V-P
814-364-2135

BHE Environmental Services
Cincinnati, Ohio
Chris Bergman, Principal Investigator
513-326-1500

BZ Engineering, Inc.
Archaeological Services Division
Allan P. VanDyke, Director
414-257-3674

Commonwealth Cultural Resources
Group
Jackson, Michigan
Donald J. Weir
517-788-3550 or 800-731-3550

Cultural Horizons, Inc.
Harrodsburg, Kentucky 40330
Nancy Ross-Stallings, Principal
Investigator
606-734-2277

Cultural Resource Analysts, Inc.
Lexington, Kentucky 40508
Chuck Niquette
859-252-4737

Environment & Archaeology L.L.C.
Florence, KY 41042
Laura Clifford, Principal Investigator
859-746-1778

GAI Consultants, Inc.
Monroeville, Pennsylvania
Jack B. Irion, Archaeological Manager
412-856-6400

*Glenn A. Black Laboratory of
Archaeology
Bloomington, Indiana
Christopher S. Peebles, Director
General Inquiries 812-855-9544

Golder Associates
Mississauga, Ontario, Canada
Scarlett Janusas, Senior Archaeologist
416-567-4444

Gray and Pape Cultural Resources
Consultants
Cincinnati, Ohio
Marlesa A. Gray and Kevin Pape
513-287-7700

Great Lakes Research Assoc., Inc.
Indianapolis, Indiana
Mark C. Branstner, President
866-487-4235

Haywood Archaeological Services
Lexington, Ohio
419-884-8899

*Indiana University - Purdue
University at Fort Wayne
Archaeological Survey
Dr. Robert G. McCullough
Fort Wayne, Indiana
260-481-6892

*Indiana State University
Anthropology Laboratory
Terre Haute, Indiana
C. Russell Stafford, Director
812-237-3997

Indiana University
Bloomington, Indiana
Cheryl Ann Munson, Archaeologist
812-855-0528

Landmark Archaeological and
Environmental Services, Inc.
Sheridan, Indiana
Jeffrey A. Plunkett, Projects Manager
317-758-9301

Louis Berger and Associates, Inc.
Marion, Iowa
Thomas J. Chadderdon, Archaeologis
319-373-3043

MAAR Assoc., Inc.
Newark, Delaware 19715
Ronald Thomas, V-P
302-996-0713

Michael Baker Jr., Inc.
Cultural Resources Section
Coraopolis, Pennsylvania 15108
Ronald C. Carlisle, Director
412-269-4600

Midwest Archaeological
Research Services, Inc.
Harvard, Illinois 60033
Rochell Lurie and M. Catherine Bird
Principal Investigators
815-943-3399

Midwest Environmental Consultants
Toledo, OhioWilliam Rutter,
GroupManager

419-891-1800

Natural & Ethical Environmental Solutions, LLC
West Chester, Ohio
Jeannine Kreinbrink
513-777-7400

PBS & J, Inc.
Austin, Texas
Michael Nash, Senior Archaeologist
512-327-6840

Program for Archaeological Research
Donald W. Linebaugh, Director
359-257-1944

Program of Archaeology
University of Louisville
Louisville, Kentucky
Phil DiBlasi, Principal Investigator
502-852-6724

Public Service Archaeological Program
Urbana-Champaign, Illinois
Dr. Kevin McGowan, Principal Investigator
(847) 548-7961 Chicago
(217) 333-1636

*Purdue University
West Lafayette, Indiana
765-494-4668

SE Technologies, Inc.
Bridgeville, Pennsylvania 15017-2839
James P. Dwyer, Senior Archaeologist
412-257-6015

TRC
Nashville, Tennessee
Larry McKee, Senior Program Manager
(615) 884-4430

There may be other archaeologists qualified to do archaeological investigations in Indiana, however, such individuals must first submit their professional credentials to the Division of Historic Preservation and Archaeology to determine that they meet the standards.

If you have questions or need additional information, please contact:

Indiana Department of Natural Resources
Division of Historic Preservation and Archaeology
402 West Washington Street, Room W274
Indianapolis, Indiana 46204-2739
Phone 317-232-1646; Fax 317-232-0693
E-mail: dhpa@dnr.IN.gov
www.IN.gov/dnr/historic

DNR
Indiana Department of Natural Resources
HISTORIC PRESERVATION AND ARCHAEOLOGY

THIS IS NOT A PERMIT

State of Indiana
DEPARTMENT OF NATURAL RESOURCES
Division of Water

Early Coordination/Environmental Assessment

DNR #: ER-11294 **Request Received:** December 20, 2004

Requestor: Gensic & Associates
Michael Gensic, PE
311 Airport North Office Park
Fort Wayne, IN 46825-6703

Project: Lake and River Enhancement (LARE) Engineering Feasibility Study, Lake Gage and Lime Lake

County/Site info: Steuben

The Indiana Department of Natural Resources has reviewed the above referenced project per your request. Our agency offers the following comments for your information and in accordance with the National Environmental Policy Act of 1969.

Regulatory Assessment: This proposal may require the formal approval of our agency pursuant to the Flood Control Act (IC 14-28-1) for any proposal to construct, excavate, or fill in or on the floodway of a stream or other flowing waterbody which has a drainage area greater than one square mile. Please submit more detailed plans to the Division of Water's Technical Services Section if you are unsure whether or not a permit will be required.

Natural Heritage Database: The Natural Heritage Program's data have been checked.
To date, no plant or animal species listed as state or federally threatened, endangered, or rare have been reported to occur in the project vicinity.

Fish & Wildlife Comments: We concur with the U.S. Fish & Wildlife Service's letter dated February 11, 2005.

Contact Staff: Christie L. Kiefer, Environ. Coordinator, Environmental Unit
Our agency appreciates this opportunity to be of service. Please do not hesitate to contact the above staff member at (317) 232-4160 or 1-877-928-3755 (toll free) if we can be of further assistance.

Date: May 3, 2005

Jon W. Eggen
Environmental Supervisor
Division of Fish and Wildlife

Mitchell E. Daniels, Jr., Governor
Kyle J. Hupfer, Director

DNR Indiana Department of Natural Resources

Kent Tracey
LARE Program
Peachtree Plaza 200
1220 N. 200 W
Angola IN 46703
PH: 260-665-3211 ext.109
FAX: 260-665-2400
ktracey@dnr.state.in.us

TO: Gensic Engineering

FROM: Kent Tracey

DATE: July 6, 2005

SUBJECT: Lake Gage Lime Lake Engineering Study

The Lake Gage and Lime Lake Association received a Lake and River Enhancement (LARE) grant in July of 2004 for an engineering feasibility study to further investigate the possibility of installing projects that were identified in the completed diagnostic study.
The projects would help to improve the water quality in the lakes by reducing the amount of sediment and nutrient entering the lake through the inlet stream. The practices involve wetland restoration and channel restoration. Permits will be required for the projects to be installed. An on site meeting was held in January 2005 to visit each site and discuss the potential modifications from the respective agencies for the required permits needed. I am not involved with the permits but am commenting as the LARE Staff overseeing this project and how they relate to the goals of the LARE Program.
Wetland restorations can offer many opportunities to improve the water quality going into the lakes. Wetlands can provide filtering and nutrient uptake with the proper type of wetland plants. They also provide for retention of the water, which will allow for the filtering and settling of sediments, at the same time retention can reduce the velocity of water in the stream that can lead to channel and streambank erosion.
At the channel restoration site, it appears that the stream was changed at sometime and allowing for a more direct path to the lake. The bank shows the evident of some under cutting and erosion at this site. By restoring the channel the flow path and the size of channel can be used to reduce sediment into the lake.
The listed practices can be installed to improve the water quality entering the lakes and they fit the goal of the LARE Program.

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
We make Indiana a cleaner, healthier place to live.

Mitchell E. Daniels, Jr.
Governor

Thomas W. Easterly
Commissioner

100 North Senate Avenue
Indianapolis, Indiana 46204
(317) 232-8603
(800) 451-6027
www.IN.gov/idem

Mr. Michael Gensic
Gensic Engineering Incorporated
311 Airport North Office Park
Fort Wayne, Indiana 46825

August 18, 2005

Dear Mr. Gensic:

Re: Early Coordination Comments
Project: Lake Gage/ Crooked Lake LARE
COE No.: 04-176-047-0
County: Steuben

The Indiana Department of Environmental Management (IDEM) provides the following comments regarding the proposed LARE (Lake and River Enhancement) project for the improvement of water quality in Lake Gage in Angola, Steuben County (Section 1, Township 37 N and Range 12 E; and Section 27, Township 38 N, Range 12 E). The project would involve altering the hydrology of the drainage system between Lake Gage and Crooked Lake by inundating areas of emergent wetland for nutrient buffering purposes. A stream restoration is also planned in the area of an abandoned mill pond just upstream of Lake Gage. The stream will be restored to roughly its original channel in order to stop ongoing erosion problems, and to increase the buffering capacity of the stream. Based on the site visit conducted on July 7, 2005, and available information, IDEM provides the following comments/ observations.

Regarding wetland inundation:

- Consider conducting a functional assessment such as INWRAP (Indiana Wetland Rapid Assessment Protocol) to fully evaluate the portions of the wetlands to be inundated. Conduct field reconnaissance of all wetlands to be inundated to identify areas of "high" quality wetland.

- Avoid inundating "high" quality wetland areas as discussed during the July 7, 2005, site visit. The area north of wetland "A" appears to contain a high diversity of plants to include tamarack, and *Carex stricta* (tussic sedge), which are characteristic of "fen" type wetlands. Wetland "B" contains "fen" type wetlands dominated by tussic sedge positioned on the outer edge of the current wetland basin. These wetland types should be identified and avoided if at all possible.

- Consider reptile and amphibian migration when planning for dam construction. Do not install structures that inhibit animal passage through the wetland complexes.

- As discussed in the field, utilize existing embankments (example- old railroad bed) when ever possible to minimize the amount of fill placed into the wetlands for dam construction.

Regarding the Stream Restoration:

- Consider using a functional assessment such as an IBI (Index of Biotic Integrity) and QHEI (Qualitative Habitat Evaluation Index) to gain an understanding of the current streams quality. These assessments should act as a guide for replacement of habitat in the new channel and monitoring of the restored stream.

- Recruit personnel trained in stream restoration or who have a history of successfully completing these types of projects. Office of Water Quality Staff understands that the existing channel is highly eroded in certain areas, and the restoration will help to correct erosion problems. However, the "transition areas" between the existing channel and the proposed channel must be examined carefully to avoid head cutting or blowouts in these areas due to grade changes.

- Construct the new channel in the "dry", and divert flow upon completion of construction.

In summary, IDEM believes the project has merits for the improvement of water quality in Lake Gage. However, careful analysis of stream and wetland impacts must be undertaken to prevent loss of higher quality stream and wetland areas due to faulty design or construction mishaps which can cause flooding of sensitive areas.

If you have any questions about this letter, please contact Mr. Ryan Cassidy, Project Manager, of my staff at 317-234-1221, or you may contact the Office of Water Quality through the IDEM Environmental Helpline (1-800-451-6027).

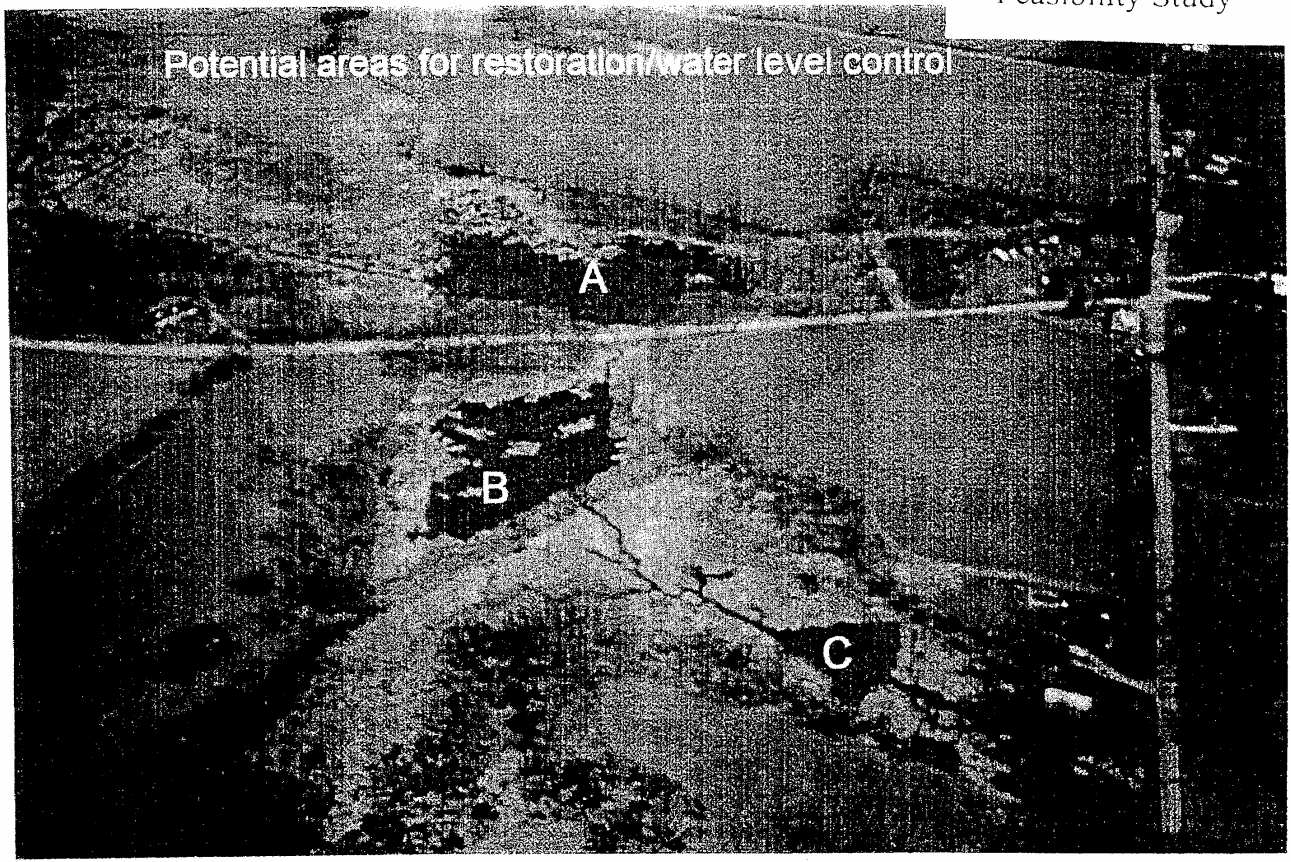
Sincerely,

Martha Clark Mettler

Martha Clark Mettler, Chief
Watershed Planning Branch
Office of Water Quality

Enclosure

cc: John Richey, USACE- South Bend (w/enclosure)
Liz McCloskey, USFWS (w/enclosure)
Keith Poole, IDNR (w/enclosure)


Potential areas for restoration/water level control
A
B
C

STEUBEN COUNTY SURVEYOR
317 S. WAYNE ST. • SUITE 3K
ANGOLA, INDIANA 46703
260-668-1000
EXT. 1800

February 3, 2005

Gensic Engineering Inc.
311 Airport North Office Park
Fort Wayne, IN 46825

RE: Environmental Review Lake Gage
and Lime Lake
Lake and River Enhancement (LARE)
Engineering Feasibility Study
Steuben County

Dear Mr. Gensic:

This letter is written as a follow up to the January 27, 2005, field review for the Lake Gage and Lime Lake Engineering Feasibility Study. The Project as presented does not involve a Steuben County Regulated Drain and therefore would not be under the direct control of Steuben County Drainage Board. But due to the fact several Steuben County Roads could be involved, the Board request input as the project proceeds.

The Steuben County Drainage Board is always interested in the water quality of its lakes as well as the natural watercourses that feed them.

Please keep the Board involved as the project moves forward and if you have any questions, please call (260) 668-1000 Ext. 1800.

Sincerely,

Larry K. Gilbert
Steuben County Surveyor

LKG/rm

APPENDIX B

INDIANA DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER
FLOOD FLOW DATA & STREAM PROFILE

Gensic Engineering Inc.
311 Airport North Office Park
Fort Wayne, Indiana 46825
260-489-7643 Fax 260-489-2227

December 1, 2004

Mr. Darrin Miller
Indiana Department of Natural Resources
Division of Water
402 W. Washington St., Room W264
Indianapolis, IN 46204-2641

RE: Lake Gage and Lime Lake LARE Engineering Feasibility Study, Steuben County

Dear Mr. Miller:

We request the 100 year flood flow for the watercourse from the outlet of Crooked Lake to the inlet of Lake Gage. Flow data at the road crossing at the inlet to Lake Gage would be sufficient. If base flow and hydrographs of the 5, 10, 25, 50, and 100 year flood flows are available it would be greatly appreciated.

We are studying the feasibility of restoring water levels on three wetland areas between Crooked Lake and Lake Gage. Water levels would be controlled by weirs constructed in the drainage channel at the outlet of the wetland areas.

Enclosed are location maps of the project area.

This flow information will be greatly appreciated. If you have any questions please call.

Respectfully

Michael Gensic, P.E.

Enclosure - Location maps

State Of Indiana
DEPARTMENT OF NATURAL RESOURCES
Division Of Water

DEPARTMENT MEMORANDUM **DATE:** April 11, 2005

File: BQ-19991

Staff: Darrin Miller
Hydraulic Engineer, ECS North

Subject: Outlet of Crooked Lake, Steuben County, Basin #03

Background: In December 2004, Mike Gensic of Gensic Engineering submitted a request for the 100-year frequency discharge for the unnamed tributary between Crooked Lake and Lake Gage. Prior to the outlet channel Crooked Lake has multiple elevations through its Third Basin. This is due to a road crossing for CR 400 W at the upstream end of the basin, and two control structures and a road crossing for Kimble Road at the downstream end.

Because of these circumstances, the USGS gage data from the First Basin of Crooked Lake does not correspond with the lake level staff gage readings at the Crooked Lake control structure. The 100-year elevation for Crooked Lake is determined as 990.3 ft by B17B data, based on the USGS gage data.

The downstream control structure is the newer of the two structures, and was built prior to 1973. It is a combination of fixed crest ogee weir spillway with a sluice gate. The older control structure about 30 feet upstream of the ogee weir has been abandoned.

Model: A HEC-RAS backwater model was developed to use rating curves for determining the 100-year frequency discharge.

Starting Elevation: An energy gradient of 0.004 was used to start the model. This is reasonable according to the Angola West quad map.

N Values: The Manning's N values for the channel and overbank conditions were estimated at 0.04, and 0.07 respectively.

Cross Sections: The cross sections for this HEC-RAS model were a based on a 1991 Division of Water survey. The stationing was reversed in the model to conform to the left-to-right looking downstream convention. One topographic data point was taken from the quadrangle map to extend the cross sections 15, 30, and 40.

Culvert: The culvert crossing for Kimble Road (County Road 350 North) is a 50.5 feet long CMP arch culvert. The bounding cross sections for the culvert are sections 30 and 15. A copy of cross section 30 was made and named 15.

Discharge Recommendation: A model was run for the Gate Open condition and the Gate Closed condition. Based on the output tables from the HEC-RAS backwater modeling, it was determined that the 100-year frequency discharge for the outlet of Crooked Lake is as follows:
Gate Closed – 80 cfs, Gate Open – 80 cfs.

The controlling structure is the culvert crossing for Kimble Road, and the weir control structure is drowned out during a 100-year event. There the rating curve approach gave the same discharge regardless of the gate being opened or closed.

The 100-year discharge for the intervening area between Crooked Lake outlet and Lake Gage inlet was determined from USGS regression equation (Glatfelter, 1984) as 24.1 cfs.

The resulting 100-year discharge at the site was calculated to be 104.1 cfs, and rounded to 100 cfs.

ke Gensi

)m: "Miller, Darrin" <dmiller@dnr.IN.gov>
: "Michael Gensic (E-mail)" <gensicengineers@fwin.net>
nt: Tuesday, April 12, 2005 2:16 PM
ach: BQ19991memo.dot; gage data.doc; hec-ras19991.zip
bject: Crooked Lake outlet discharge

following attachments include a technical memo regarding the HEC-RAS
el of the outlet channel of Crooked Lake, the HEC-RAS model, and the B17B
data from the USGS gaging station on Crooked Lake.

B17B data lists frequency curve chart with "Exceedance Probabilities"
ents listed as decimals, (.010 for 100-year frequency). The computed
is listed as the peak staff gage reading x 100. The following method
be used for the 20-year and 50-year, as well as the 100-year lake
ation:

m 980.26 ft NGVD + computed reading for 100-year (or .010) of 1010
ed by 100 = 990.36 ft NGVD

n Miller
ion of Water
N. Washington St., Rm W264
napolis, IN 46250

Q19991memo.dot>> <<gage data.doc>> <<hec-ras19991.zip>>

```
*********************************                                  MARCH 17, 2005
* FLOOD FLOW FREQUENCY ANALYSIS *                                   15: 1:56
* VERSION DATE  -  DEC 12, 1983 *
* AFTER BULLETIN 17B, SEPT 1981 *
*********************************

 **TITLE CARD(S)**
 TT     CROOKED LAKE AT CROOKED LAKE  (STEUBEN COUNTY)
04097850
 TT    LEGAL LEVEL = 988.43    NGVD DATUM = 980.26
04097850
 TT                  PEAK X 100
04097850
 TT    1971 RECORD ABSENT
04097850

 **SYSTEMATIC EVENTS**
      54 EVENTS TO BE ANALYZED

 **END OF INPUT DATA**
ED ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++


-SKEW WEIGHTING -
-----------------------------------------------------------------
BASED ON  54 EVENTS, MEAN-SQUARE ERROR OF STATION SKEW =-99.000
DEFAULT OR INPUT MEAN-SQUARE ERROR OF GENERALIZED SKEW =   .302
-----------------------------------------------------------------


 PRELIMINARY RESULTS
-FREQUENCY CURVE-
*********************************************************************
*........FLOW,CFS........*                *...CONFIDENCE LIMITS...*
*          EXPECTED      * EXCEEDANCE     *                       *
*  COMPUTED  PROBABILITY * PROBABILITY    *  .05 LIMIT  .95 LIMIT *
*------------------------*----------------*-----------------------*
*     1020.       1020.  *     .002       *      1040.       1000. *
*     1010.       1020.  *     .005       *      1030.        998. *
*     1010.       1010.  *     .010       *      1020.        993. *
*     1000.       1000.  *     .020       *      1020.        987. *
*      991.        993.  *     .040       *      1010.        979. *
*      978.        979.  *     .100       *       991.        967. *
*      964.        964.  *     .200       *       975.        954. *
*      935.        935.  *     .500       *       943.        926. *
*      902.        901.  *     .800       *       910.        892. *
*      883.        882.  *     .900       *       893.        871. *
*      867.        865.  *     .950       *       879.        853. *
*      836.        831.  *     .990       *       850.        817. *
*++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++*
*   FREQUENCY CURVE STATISTICS   *     STATISTICS BASED ON          *
*--------------------------------*--------------------------------*
*  MEAN LOGARITHM         2.9691 *  HISTORIC EVENTS           0   *
*  STANDARD DEVIATION      .0174 *  HIGH OUTLIERS         0     *
*  COMPUTED SKEW          -.5192 *  LOW OUTLIERS          0     *
*  GENERALIZED SKEW    -99.0000  *  ZERO OR MISSING       0     *
*  ADOPTED SKEW           -.5192 *  SYSTEMATIC EVENTS        54 *
*********************************************************************


 FINAL RESULTS
-PLOTTING POSITIONS-
*********************************************************************
*.....EVENTS ANALYZED......*..........ORDERED EVENTS.........*
*                          *          WATER                  WEIBULL  *
* MON DAY  YEAR  FLOW,CFS  *   RANK  YEAR    FLOW,CFS  PLOT POS *
*--------------------------*-----------------------------------*
*   3  17  1946     862.   *     1   1996     1029.     .0182   *
*   5   3  1947     884.   *     2   1985     1007.     .0364   *
*   4   1  1948     876.   *     3   1993      994.     .0545   *
*   2  28  1949     886.   *     4   1986      973.     .0727   *
*   4   5  1950     969.   *     5   1981      972.     .0909   *
*   7  11  1951     932.   *     6   1950      969.     .1091   *
*   2  16  1952     925.   *     7   1989      967.     .1273   *
*   5  17  1953     876.   *     8   1991      966.     .1455   *
*   5   4  1954     907.   *     9   1973      960.     .1636   *
*  10  17  1955     918.   *    10   1987      960.     .1818   *
*   5  12  1956     947.   *    11   1990      959.     .2000   *
```

6	29	1957	907.	12	1997	954.	.2182	
9	17	1958	888.	13	1980	953.	.2364	
4	9	1959	922.	14	1998	953.	.2545	
5	22	1960	911.	15	1974	950.	.2727	
4	28	1961	927.	16	1978	950.	.2909	
3	24	1962	895.	17	1983	950.	.3091	
6	10	1963	866.	18	2000	949.	.3273	
5	9	1964	820.	19	1976	948.	.3455	
4	27	1965	934.	20	1988	947.	.3636	
4	25	1966	930.	21	1956	947.	.3818	
4	6	1967	940.	22	1995	947.	.4000	
6	27	1968	930.	23	1992	943.	.4182	
2	8	1969	930.	24	1999	942.	.4364	
6	2	1970	920.	25	1967	940.	.4545	
5	14	1972	930.	26	1984	938.	.4727	
6	5	1973	960.	27	1994	938.	.4909	
2	21	1974	950.	28	1979	936.	.5091	
6	6	1975	910.	29	1965	934.	.5273	
3	7	1976	948.	30	1951	932.	.5455	

FINAL RESULTS
-PLOTTING POSITIONS-

.....EVENTS ANALYZED.....				...ORDERED EVENTS...			
MON	DAY	YEAR	FLOW,CFS	RANK	WATER YEAR	FLOW,CFS	WEIBULL PLOT POS
4	6	1977	896.	31	1972	930.	.5636
4	16	1978	950.	32	1966	930.	.5818
4	13	1979	936.	33	1968	930.	.6000
6	7	1980	953.	34	1969	930.	.6182
6	14	1981	972.	35	1961	927.	.6364
10	1	1981	908.	36	1952	925.	.6545
5	3	1983	950.	37	1959	922.	.6727
4	17	1984	938.	38	1970	920.	.6909
4	6	1985	1007.	39	1956	918.	.7091
7	16	1986	973.	40	1960	911.	.7273
10	3	1986	960.	41	1975	910.	.7455
0	0	1988	947.	42	1982	908.	.7636
0	0	1989	967.	43	1954	907.	.7818
0	0	1990	959.	44	1957	907.	.8000
0	0	1991	966.	45	1977	896.	.8182
0	0	1992	943.	46	1962	895.	.8364
0	0	1993	994.	47	1958	888.	.8545
0	0	1994	938.	48	1949	886.	.8727
0	0	1995	947.	49	1947	884.	.8909
0	0	1996	1029.	50	1953	876.	.9091
0	0	1997	954.	51	1948	876.	.9273
0	0	1998	953.	52	1963	866.	.9455
0	0	1999	942.	53	1946	862.	.9636
0	0	2000	949.	54	1964	820.	.9818

-OUTLIER TESTS -

LOW OUTLIER TEST

BASED ON 54 EVENTS, 10 PERCENT OUTLIER TEST VALUE K(N) = 2.798

1 LOW OUTLIER(S) IDENTIFIED BELOW TEST VALUE OF 832.6

STATISTICS AND FREQUENCY CURVE ADJUSTED FOR 1 LOW OUTLIER(S)

HIGH OUTLIER TEST

BASED ON 53 EVENTS, 10 PERCENT OUTLIER TEST VALUE K(N) = 2.790

0 HIGH OUTLIER(S) IDENTIFIED ABOVE TEST VALUE OF 1033.

-SKEW WEIGHTING -

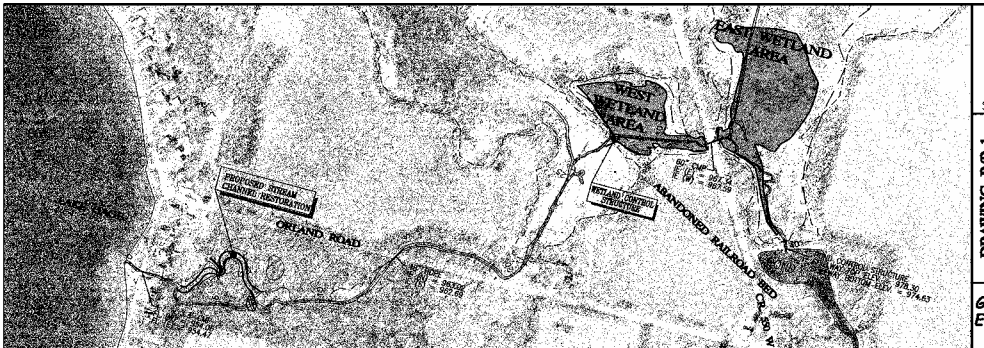
BASED ON 54 EVENTS, MEAN-SQUARE ERROR OF STATION SKEW =-99.000
DEFAULT OR INPUT MEAN-SQUARE ERROR OF GENERALIZED SKEW = .302

FINAL RESULTS

-FREQUENCY CURVE-

FLOW,CFS		EXCEEDANCE	CONFIDENCE LIMITS	
COMPUTED	EXPECTED PROBABILITY	PROBABILITY	.05 LIMIT	.95 LIMIT
1030.	1040.	.002	1060.	1020.
1020.	1030.	.005	1040.	1010.
1010.	1020.	.010	1030.	1000.
1000.	1010.	.020	1020.	992.
994.	995.	.040	1010.	982.
977.	978.	.100	989.	967.
962.	962.	.200	972.	953.
933.	933.	.500	941.	925.
905.	905.	.800	913.	896.
891.	890.	.900	900.	880.
879.	877.	.950	889.	866.
857.	854.	.990	869.	841.

FREQUENCY CURVE STATISTICS		STATISTICS BASED ON	
MEAN LOGARITHM	2.9698	HISTORIC EVENTS	0
STANDARD DEVIATION	.0157	HIGH OUTLIERS	0
COMPUTED SKEW	-.0281	LOW OUTLIERS	1
GENERALIZED SKEW	-99.0000	ZERO OR MISSING	0
ADOPTED SKEW	-.0281	SYSTEMATIC EVENTS	54



0 150 300
Scale 1" = 300'

DRAWING P/P 1

CROOKED LAKE OUTLET STREAM PLAN AND PROFILE

LAKE GAGE AND LAME LAKE ENGINEERING FEASIBILITY STUDY

Gensic Engineering Inc
Civil Engineers

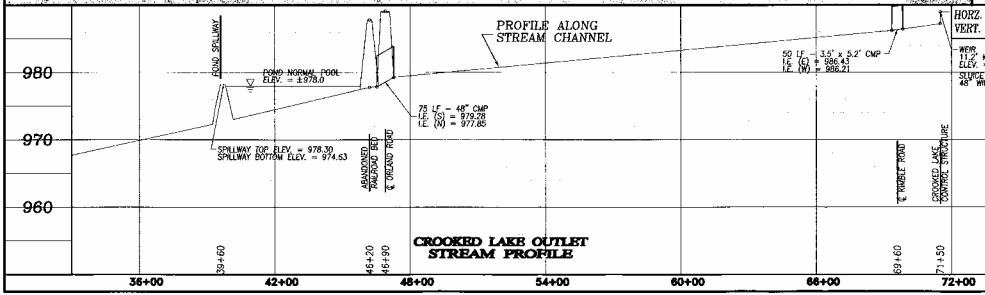
HORZ. SCALE: 1" = 300'
VERT. SCALE: 1" = 10'

DRAWING P/P 2

CROOKED LAKE OUTLET STREAM PLAN AND PROFILE

LAKE GAGE AND LAKE ENGINEERING FEASIBILITY STUDY

Gensic Engineering Inc
Civil Engineers



APPENDIX C

WETLAND DETERMINATION DATA

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/18/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Upland woods
Is the site significantly disturbed (Atypical Situation	Yes	No		
Is the area a potential Problem Area?	Yes	No	Transect ID:	T1
(If needed, explain on reverse.)			Plot ID:	P1

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Carya ovalis	Canopy	UPL*	9.	Galium aperine	Herbaceous	FACU
2.	Quercus velutina	Canopy	UPL*	10.			
3.	Prunus seratina	Canopy	FACU	11.			
4.	Cornus racimosa	Sub-canopy	FACW-	12.			
5.	Conicera tataricta	Sub-canopy	FACU*	13.			
6.	Acer negundo	Sub-canopy	FACW-	14.			
7.	Bromus inermis	Herbaceous	UPL*	15.			
8.	Parthenocissus quinquefolia	Herbaceous	FAC-	16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 22%

Remarks: NON-DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	0	(in.)	Secondary Indicators (2 or more required)
			Oxidized Root Channels in Upper 12 inches
Depth to Free Water in Pit:	> 16"	(in.)	Water-Stained Leaves
			Local Soil Survey Data
Depth to Saturated Soil:	> 16"	(in.)	FAC-Neutral Test
			Other (Explain in Remarks)

Remarks: ABSENCE OF HYDROLOGY AND INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T1 P1

SOILS

Map Unit Name
(Series and Phase): Casco gravely sandy loam Drainage Class: Somewhat excessively drained

Taxonomy (Subgroup): Typic Hapludalfs Field Observations Confirm Mapped Type? (circle) **Yes** No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-10	1	10YR3/3		GRAVELLY LOAM

Hydric Soil Indicators:

Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION NOT MET AT DATA STATION BY SOIL COLOR.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	**No**
Wetland Hydrology Present?	Yes	**No**
Hydric Soils Present?	Yes	**No**

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	**No**

Remarks:
NON-WETLAND BASED ON ABSENCE OF VEGETATION , HYDROLOGY, AND SOILS INDICATORS.
LIGHTLY WOODED STEEP SLOPE EAST OF CR 550 W.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/18/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Upland woods
Is the site significantly disturbed (Atypical Situation	Yes	No		
Is the area a potential Problem Area?	Yes	No	Transect ID:	T1
(If needed, explain on reverse.)			Plot ID:	P2

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Carya ovalis	Canopy	UPL*	9.			
2.	Lonicera tatarica	Sub-canopy	FACU*	10.			
3.	Acer negundo	Sub-canopy	FACW-	11.			
4.	Sambcus canedensis	Sub-canopy	FACW-	12.			
5.	Parthenocissus quinquefolia	Sub-canopy	FAC-	13.			
6.	Parthenocissus quinquefolia	Herbaceous	FAC-	14.			
7.	Geum cadensis	Herbaceous	FAC	15.			
8.	Toxicodendron radicans	Herbaceous	FAC+	16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 50%

Remarks: NON-DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	0	(in.)
Depth to Free Water in Pit:	21	(in.)
Depth to Saturated Soil:	16	(in.)

Secondary Indicators (2 or more required)
- Oxidized Root Channels in Upper 12 inches
- Water-Stained Leaves
- Local Soil Survey Data
- FAC-Neutral Test
- Other (Explain in Remarks)

Remarks: ABSENCE OF HYDROLOGY AND INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T1 P2

SOILS

Map Unit Name
(Series and Phase): Milgrove loam Drainage Class: very poorly drained

Taxonomy (Subgroup): Typic Argiaquolls Field Observations Confirm Mapped Type? (circle) Yes **No**

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-10	1	10YR2/1		SANDY LOAM

Hydric Soil Indicators:

Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS MET AT DATA STATION BY SOIL COLOR.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	**No**
Wetland Hydrology Present?	Yes	**No**
Hydric Soils Present?	**Yes**	No

(Circle)
Is this Sampling Point Within a Wetland? Yes **No**

Remarks:
NON-WETLAND BASED ON ABSENCE OF VEGETATION AND HYDROLOGY INDICATORS.
BRUSHY TOE OF SLOPE JUST ABOVE WETLAND

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/18/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Scrub wetland
Is the site significantly disturbed (Atypical Situation	Yes	No		(SECTION IA)
Is the area a potential Problem Area?	Yes	No	Transect ID:	T1
(If needed, explain on reverse.)			Plot ID:	P3

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Ulmus americana	Canopy	FACW-	9.	Rumex obtusifolius	Herbaceous	FACW
2.	Cornus racemosa	Sub-canopy	FACW-	10.	Impatiens sp.	Herbaceous	FACW
3.	Cornus sericea	Sub-canopy	FACW	11.	Circaea alpina	Herbaceous	FACW
4.	Lonicera morrowii	Sub-canopy	NI	12.	Ranunculus arbortivus	Herbaceous	FACW
5.	Sambucus canadensis	Sub-canopy	FACW-	13.			
6.	Ribes americanum	Sub-canopy	FACW	14.			
7.	Vitis riparia	Vine	FACW-	15.			
8.	Onoclea sensibilis	Herbaceous	FACW	16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 92%

Remarks: CRITERIAN MET BY DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- X Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	0	(in.)
Depth to Free Water in Pit:	12	(in.)
Depth to Saturated Soil:	surface	(in.)

Secondary Indicators (2 or more required)
- Oxidized Root Channels in Upper 12 inches
- Water-Stained Leaves
- Local Soil Survey Data
- FAC-Neutral Test
- Other (Explain in Remarks)

Remarks: PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T1P3

SOILS

Map Unit Name
(Series and Phase): Houghton muck, undrained Drainage Class: very poorly drained

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) Yes **No**

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-11	1	N 2.5/0		MUCK
>11	2	10YR 4/1		SANDY LOAM

Hydric Soil Indicators:

Histosol	Concretions
X Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	No
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	No

Remarks:
WETLAND BASED ON PRESENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS. GROUND WATER CHARGED SHRUBBY WETLAND. ARTIFICIALLY AND PARTIALLY DRAINED BY DITCH FLOWING SOUTH INTO CREEK. THIS IS THE NORTHEAST LOBE OF LARGE WETLAND COMPLEX.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/18/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Scrub wetland
Is the site significantly disturbed (Atypical Situation	Yes	No		(SECTION IA)
Is the area a potential Problem Area?	Yes	No	Transect ID:	T1
(If needed, explain on reverse.)			Plot ID:	P4

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Ulmus americana	Canopy	FACW-	9.	Cardamine bulbosa	Herbaceous	OBL
2.	Cornus obliqua	Sub-canopy	FACW+	10.	Aster puniceous	Herbaceous	OBL
3.	Cornus sericea	Sub-canopy	FACW	11.	Solidago rugosa	Herbaceous	FAC+
4.	Salix discolor	Sub-canopy	FACW	12.	Lathyrus palustris	Herbaceous	FACW
5.	Carex stricta	Herbaceous	OBL	13.			
6.	Eupatorium maculatum	Herbaceous	OBL	14.			
7.	Impatiens sp.	Herbaceous	FACW	15.			
8.	Onoclea sensibilis	Herbaceous	FACW	16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 100%

Remarks: CRITERIAN MET BY DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Field Observations:

Depth of Surface Water:	0	(in.)
Depth to Free Water in Pit:	surface	(in.)
Depth to Saturated Soil:	surface	(in.)

Wetland Hydrology Indicators

Primary Indicators
- Inundated
- X Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
- Oxidized Root Channels in Upper 12 inches
- Water-Stained Leaves
- Local Soil Survey Data
- FAC-Neutral Test
- Other (Explain in Remarks)

Remarks: CRITERIAN MET BY PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T1P4

SOILS

Map Unit Name
(Series and Phase): Houghton muck, undrained Drainage Class: very poorly drained

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-16	1	N 2.5/0		MUCK

Hydric Soil Indicators:

X Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	No
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	No

Remarks:
WETLAND BASED ON PRESENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS.
GROUND WATER CHARGED SHRUBBY WETLAND

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/18/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Emergent wetland
Is the site significantly disturbed (Atypical Situation	Yes	No		(SECTION IA)
Is the area a potential Problem Area?	Yes	No	Transect ID:	T1
(If needed, explain on reverse.)			Plot ID:	P5

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Carex stricta	Herbaceous	OBL	9.			
2.	Carex sartwellii	Herbaceous	FACW+	10.			
3.	Rosa palustris	Herbaceous	OBL	11.			
4.				12.			
5.				13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 100%

Remarks: CRITERIAN MET BY DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- X Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	0	(in.)	Secondary Indicators (2 or more required)
			Oxidized Root Channels in Upper 12 inches
Depth to Free Water in Pit:	surface	(in.)	Water-Stained Leaves
			Local Soil Survey Data
Depth to Saturated Soil:	surface	(in.)	FAC-Neutral Test
			Other (Explain in Remarks)

Remarks: CRITERIAN MET BY PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T1P5

SOILS

Map Unit Name
(Series and Phase): Houghton muck, undrained Drainage Class: very poorly drained

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0	1	10YR 2/1		MUCK

Hydric Soil Indicators:

Histosol	Concretions
x Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	No
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	No

Remarks:
WETLAND BASED ON PRESENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS.
GRAZED SEDGE MEADOW

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/18/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Upland woods
Is the site significantly disturbed (Atypical Situation	Yes	No		
Is the area a potential Problem Area?	Yes	No	Transect ID:	T2
(If needed, explain on reverse.)			Plot ID:	P1

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Quercus coccinea	Canopy	UPL*	9.			
2.	Juglans nigra	Canopy	FACU	10.			
3.	Bromus inermis	Herbaceous	FACU*	11.			
4.	Dactylus glomerata	Herbaceous	FACU	12.			
5.	Alliaria petiolata	Herbaceous	FAC	13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 20%

Remarks: NON-DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	0	(in.)	Secondary Indicators (2 or more required)
			Oxidized Root Channels in Upper 12 inches
Depth to Free Water in Pit:	> 16"	(in.)	Water-Stained Leaves
			Local Soil Survey Data
Depth to Saturated Soil:	> 16"	(in.)	FAC-Neutral Test
			Other (Explain in Remarks)

Remarks: ABSENCE OF HYDROLOGY AND INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T2 P1

SOILS

Map Unit Name
(Series and Phase): Casco gravely sandy loam Drainage Class: Somewhat excessively drained

Taxonomy (Subgroup): Typic Hapludalfs Field Observations Confirm Mapped Type? (circle) Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
10	1	10YR3/3		

Hydric Soil Indicators:

Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION NOT MET AT DATA STATION BY SOIL COLOR.

WETLAND DETERMINATION

		(Circle)
Hydrophytic Vegetation Present?	Yes	No
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	No

Remarks:
NON-WETLAND BASED ON ABSENCE OF VEGETATION , HYDROLOGY, AND SOILS INDICATORS.
UPLAND FIELD EDGE

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/18/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Scrub wetland
Is the site significantly disturbed (Atypical Situation	Yes	No		(SECTION IA)
Is the area a potential Problem Area?	Yes	No	Transect ID:	T2
(If needed, explain on reverse.)			Plot ID:	P2

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Juglans nigra	Canopy	FACU	9.			
2.	Fraxinus pennsylvanica	Canopy	FACW	10.			
3.	Corylus americana	Sub-canopy	FACU-	11.			
4.	Phalaris arundinacea	Herbaceous	FACW+	12.			
5.	Impatiens sp	Herbaceous	FACW	13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 60%

Remarks: CRITERIAN MET BY DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- X Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	0	(in.)	Secondary Indicators (2 or more required)
			Oxidized Root Channels in Upper 12 inches
Depth to Free Water in Pit:	12	(in.)	Water-Stained Leaves
			Local Soil Survey Data
Depth to Saturated Soil:	surface	(in.)	FAC-Neutral Test
			Other (Explain in Remarks)

Remarks: CRITERIAN MET BY PRESENCE OF HYDROLOGY AND INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T2P2

SOILS

Map Unit Name
(Series and Phase): Houghton muck Drainage Class ss: Very poorly drained

Taxonomy (Subgroup): Typic Medisaprist Field Observations Confirm Mapped Type? (circle) Yes **No**

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-9	1	N 2.5/0		MUCK
9-17	2	2.5YR 5/1		SANDY LOAM

Hydric Soil Indicators:

	Histosol	Concretions
x	Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
	Sulfidic Odor	Organic Streaking in Sandy Soils
	Aquic Moisture Regime	Listed on Local Hydric Soils List
	Reducing Conditions	Listed on National Hydric Soils List
	Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION MET AT DATA STATION BY HYDRIC SOIL INDICATOR

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	No
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	No

Remarks:
WETLAND BASED ON PRESENCE OF HYDROPHYTIC VEGETATION, HYDROLOGY, AND HYDRIC SOILS INDICATORS.
WETLAND EDGE BASE OF SLOPE. SAME LOBE OF WETLAND COMPLEX.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/18/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Scrub/Emergent
Is the site significantly disturbed (Atypical Situation	Yes	No		wetland (SECTION IA)
Is the area a potential Problem Area?	Yes	No	Transect ID:	T2
(If needed, explain on reverse.)			Plot ID:	P3

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Cornus sericea	Sub-canopy	FACW+	9.			
2.	Spiraea alba	Sub-canopy	FACW+	10.			
3.	Cornus foemina	Sub-canopy	FACW-	11.			
4.	Calamagrostics canadensis	Herbaceous	OBL	12.			
5.	Carex stricta	Herbaceous	OBL	13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 100%

Remarks: CRITERIAN MET BY DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- X Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	0	(in.)	Secondary Indicators (2 or more required)
			Oxidized Root Channels in Upper 12 inches
Depth to Free Water in Pit:	3	(in.)	Water-Stained Leaves
			Local Soil Survey Data
Depth to Saturated Soil:	surface	(in.)	FAC-Neutral Test
			Other (Explain in Remarks)

Remarks: CRITERIAN MET BY PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T2P3

SOILS

Map Unit Name
(Series and Phase): Houghton muck, undrained Drainage Class: very poorly drained

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) **Yes** No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-16	1	10YR 2/1		MUCK

Hydric Soil Indicators:

X Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	**Yes**	No
Wetland Hydrology Present?	**Yes**	No
Hydric Soils Present?	**Yes**	No

	(Circle)	
Is this Sampling Point Within a Wetland?	**Yes**	No

Remarks:
WETLAND BASED ON PRESENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS.
HIGH QUALITY SEDGE MEADOW

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/18/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Emergent wetland
Is the site significantly disturbed (Atypical Situation	Yes	No		(SECTION IA)
Is the area a potential Problem Area?	Yes	No	Transect ID:	T2
(If needed, explain on reverse.)			Plot ID:	P4

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Fraxinus pennslyvanica	Canopy	FACW	9.			
2.	Carex stricta	Herbaceous	OBL	10.			
3.	Calamagrostics canadensis	Herbaceous	OBL	11.			
4.	Typha X glauca	Herbaceous	OBL	12.			
5.				13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 100%

Remarks: CRITERIAN MET BY DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- X Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	0	(in.)	Secondary Indicators (2 or more required)
			Oxidized Root Channels in Upper 12 inches
Depth to Free Water in Pit:	1	(in.)	Water-Stained Leaves
			Local Soil Survey Data
Depth to Saturated Soil:	surface	(in.)	FAC-Neutral Test
			Other (Explain in Remarks)

Remarks: CRITERIN MET BY PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T2 P4

SOILS

Map Unit Name
(Series and Phase): Houghton muck, undrained Drainage Class: very poorly drained

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) **Yes** No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-16	1	10YR 2/1		MUCK

Hydric Soil Indicators:

X Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	**Yes**	No
Wetland Hydrology Present?	**Yes**	No
Hydric Soils Present?	**Yes**	No

(Circle)
Is this Sampling Point Within a Wetland? **Yes** No

Remarks:
WETLAND BASED ON PRESENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS.
SEDGE MEADOW.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/18/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Scrub wetland
Is the site significantly disturbed (Atypical Situation	Yes	No		(SECTION IA)
Is the area a potential Problem Area?	Yes	No	Transect ID:	T2
(If needed, explain on reverse.)			Plot ID:	P5

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Fractinus pennsylvanica	Canopy	FACW	9.			
2.	Cornus racemosa	Sub-canopy	FACW-	10.			
3.	Corylus americana	Sub-canopy	FACU	11.			
4.	Vitis riparia	Vine	FACW-	12.			
5.	Parthenocissus Quinquefolia	Vine	FAC-	13.			
6.	Cornus racemosa	Herbaceous	FACW-	14.			
7.	Geum laciniatum	Herbacious	FACW	15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 71%

Remarks: CRITERIAN MET BY DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Wetland Hydrology Indicators

Primary Indicators
- Inundated
- X Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	0	(in.)
Depth to Free Water in Pit:	16	(in.)
Depth to Saturated Soil:	12	(in.)

Secondary Indicators (2 or more required)
- Oxidized Root Channels in Upper 12 inches
- Water-Stained Leaves
- Local Soil Survey Data
- FAC-Neutral Test
- Other (Explain in Remarks)

Remarks: CRITERIAN MET BY PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T2P5

SOILS

Map Unit Name
(Series and Phase): Milgrove Loam Drainage Class: very poorly drained

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-12	1	10YR2/1		SANDY LOAM
>12	2	N2.5 Y/0		LOAMY SAND

Hydric Soil Indicators:

Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
X Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	No
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	No

Remarks:
WETLAND BASED ON PRESENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS.
SHRUBBY EDGEOF WETLAND.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE Stud
Applicant/Owner: Lake Gage & Lime Lake Assoc. In
Investigator: Nathan Simons

Date: 05/18/05
County: Steuben
State: Indiana
Location: Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No
Is the site significantly disturbed (Atypical Situation	Yes	No
Is the area a potential Problem Area?	Yes	No
(If needed, explain on reverse.)		

Community ID: Upland woods
Transect ID: T2
Plot ID: P6

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Sassafras albidum	Canopy	FACU	9.	Alliaria petiolata	Herbaceous	FAC
2.	Carya ovalis	Canopy	UPL*	10.			
3.	Prunus serotina	Canopy	FACU	11.			
4.	Cornus racemosa	Sub-canopy	FACW-	12.			
5.	Corylus americana	Sub-canopy	FACU-	13.			
6.	Anemonella thalictroides	Herbaceous	UPL*	14.			
7.	Geum laciniatum	Herbaceous	FACW	15.			
8.	Cornus racemosa	Herbaceous	FACW-	16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 44%

Remarks: NON-DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	0	(in.)
Depth to Free Water in Pit:	> 16"	(in.)
Depth to Saturated Soil:	> 16"	(in.)

Secondary Indicators (2 or more required)
- Oxidized Root Channels in Upper 12 inches
- Water-Stained Leaves
- Local Soil Survey Data
- FAC-Neutral Test
- Other (Explain in Remarks)

Remarks: ABSENCE OF HYDROLOGY AND INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T2P6

SOILS

Map Unit Name
(Series and Phase): Casco gravely sandy loam Drainage Class: Somewhat excessively drained

Taxonomy (Subgroup): Typic Hapludalfs Field Observations Confirm Mapped Type? (circle) Yes **No**

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-16	1	10YR3/2		SANDY LOAM

Hydric Soil Indicators:

Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION NOT MET AT DATA STATION BY SOIL COLOR.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	**No**
Wetland Hydrology Present?	Yes	**No**
Hydric Soils Present?	Yes	**No**

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	**No**

Remarks:
NON-WETLAND BASED ON ABSENCE OF VEGETATION , HYDROLOGY, AND SOILS INDICATORS.
WOODED SLOPE.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE Stud
Applicant/Owner: Lake Gage & Lime Lake Assoc. In
Investigator: Nathan Simons

Date: 05/18/05
County: Steuben
State: Indiana
Location: Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No
Is the site significantly disturbed (Atypical Situation	Yes	No
Is the area a potential Problem Area?	Yes	No
(If needed, explain on reverse.)		

Community ID: :mergent wetland
(SECTION IA)
Transect ID: T3
Plot ID: P1

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Phalaris arundinacea		FACW+	9.			
2.				10.			
3.				11.			
4.				12.			
5.				13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 100%

Remarks: CRITERIAN MET BY DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Wetland Hydrology Indicators

Primary Indicators
- X Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	2	(in.)	Secondary Indicators (2 or more required)
			Oxidized Root Channels in Upper 12 inches
Depth to Free Water in Pit:		(in.)	Water-Stained Leaves
			Local Soil Survey Data
Depth to Saturated Soil:		(in.)	FAC-Neutral Test
			Other (Explain in Remarks)

Remarks: CRITERIAN MET BY PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T3 P1

SOILS

Map Unit Name
(Series and Phase): Houghton muck, undrained Drainage Class: very poorly drained

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-16	1	10YR 2/1		MUCK

Hydric Soil Indicators:

X Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	No
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	No

Remarks:
WETLAND BASED ON PRESENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS.
DATA POINT IS NEAR CONFLUENCE OF SOUTH FLOWING DITCH AND CREEK EAST OF ROAD BANK.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE Stud
Applicant/Owner: Lake Gage & Lime Lake Assoc. In
Investigator: Nathan Simons

Date: 05/18/05
County: Steuben
State: Indiana
Location: Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No
Is the site significantly disturbed (Atypical Situation	Yes	No
Is the area a potential Problem Area?	Yes	No
(If needed, explain on reverse.)		

Community ID: Emergent wetland (SECTION IA)
Transect ID: T3
Plot ID: P2

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Phalaris arundinacea		FACW+	9.			
2.				10.			
3.				11.			
4.				12.			
5.				13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 100%

Remarks: CRITERIAN MET BY DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- X Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

			Secondary Indicators (2 or more required)
Depth of Surface Water:	0	(in.)	Oxidized Root Channels in Upper 12 inches
Depth to Free Water in Pit:	surface	(in.)	Water-Stained Leaves
			Local Soil Survey Data
Depth to Saturated Soil:	surface	(in.)	FAC-Neutral Test
			Other (Explain in Remarks)

Remarks: CRITERIAN MET BY PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T3P2

SOILS

Map Unit Name
(Series and Phase): Houghton muck, undrained Drainage Class: very poorly drained

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) **Yes** No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-16	1	10YR 2/1		MUCK

Hydric Soil Indicators:

X Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	**Yes**	No
Wetland Hydrology Present?	**Yes**	No
Hydric Soils Present?	**Yes**	No

	(Circle)	
Is this Sampling Point Within a Wetland?	**Yes**	No

Remarks:
WETLAND BASED ON PRESENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS.
DEAD ASH TREES IN AREA ARE DUE TO FORMER BEAVER ACTIVITY.
DATA POINT IS EAST OF CREEK.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/18/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Scrub wetland
Is the site significantly disturbed (Atypical Situation	Yes	No		(SECTION IA)
Is the area a potential Problem Area?	Yes	No	Transect ID:	T3
(If needed, explain on reverse.)			Plot ID:	P3

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Fraxinus pennsylvanica	Canopy	FACW	9.			
2.	Cornus obliqua	Sub-canopy	FACW+	10.			
3.	Cornus racemosa	Sub-canopy	FACW-	11.			
4.	Carex lacustris	Herbaceous	OBL	12.			
5.	Phalaris arundinacea	Herbaceous	FACW+	13.			
6.	Carex stricta	Herbaceous	OBL	14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 100%

Remarks: CRITERIAN MET BY DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- X Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	0	(in.)	Secondary Indicators (2 or more required)
			Oxidized Root Channels in Upper 12 inches
Depth to Free Water in Pit:	surface	(in.)	Water-Stained Leaves
			Local Soil Survey Data
Depth to Saturated Soil:	surface	(in.)	FAC-Neutral Test
			Other (Explain in Remarks)

Remarks: CRITERIAN MET BY PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T3P3

SOILS

Map Unit Name
(Series and Phase): Houghton muck, undrained Drainage Class: very poorly drained

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-16	1	10YR 2/1		MUCK

Hydric Soil Indicators:

X Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	No
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	No

Remarks:
WETLAND BASED ON PRESENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE Stud
Applicant/Owner: Lake Gage & Lime Lake Assoc. In
Investigator: Nathan Simons

Date: 05/18/05
County: Steuben
State: Indiana
Location: Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site? Yes No
Is the site significantly disturbed (Atypical Situation Yes No
Is the area a potential Problem Area? Yes No
(If needed, explain on reverse.)

Community ID: Upland woods
Transect ID: T3
Plot ID: P4

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Quercus velutina	Canopy	UPL*	9.	Carex pensylvanica	Herbaceous	UPL*
2.	Pyrus communis	Canopy	UPL*	10.			
3.	Carya ovata	Canopy	FACU	11.			
4.	Cornus racemosa	Sub-canopy	FACW-	12.			
5.	Rosa multiflora	Sub-canopy	FACU	13.			
6.	Viburnum lentago	Sub-canopy	FAC+	14.			
7.	Alliaria petiolata	Herbaceous	FAC	15.			
8.	Phalaris arundinacea	Herbaceous	FACW+	16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 44%

Remarks: NON-DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:
- Depth of Surface Water: 0 (in.)
- Depth to Free Water in Pit: (in.)
- Depth to Saturated Soil: 18" (in.)

Secondary Indicators (2 or more required)
- Oxidized Root Channels in Upper 12 inches
- Water-Stained Leaves
- Local Soil Survey Data
- FAC-Neutral Test
- Other (Explain in Remarks)

Remarks: ABSENCE OF HYDROLOGY AND INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T3P4

SOILS

Map Unit Name
(Series and Phase): Casco gravelly sand loam Drainage Class: excessively drained soil

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) Yes **No**

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-16	1	2.5YR 3/2		LOAMY SAND
> 16	2	2.5YR 4/2		LOAMY SAND

Hydric Soil Indicators:

Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS NOT MET AT DATA STATION BY ABSENCE OF HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	**No**
Wetland Hydrology Present?	Yes	**No**
Hydric Soils Present?	Yes	**No**

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	**No**

Remarks:
NON-WETLAND BASED ON ABSENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS.
TOE OF SLOPE ABOVE WETLAND.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/18/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Upland woods
Is the site significantly disturbed (Atypical Situation	Yes	No		
Is the area a potential Problem Area?	Yes	No	Transect ID:	T4
(If needed, explain on reverse.)			Plot ID:	P1

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Morus alba	Canopy	FAC	9.			
2.	Acer negundo	Box-elder	FACW-	10.			
3.	Rosa multiflora	Sub-canopy	FACU	11.			
4.	Vitis riparia	Vine	FACW	12.			
5	Alliaria petiolata	Herbaceous	FAC	13.			
6.	Phalaris arundinacea	Herbaceous	FACW+	14.			
7.	Claytonia virginica	Herbaceous	FACU	15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 57%

Remarks:CRITERIAN MET BY DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	0	(in.)
Depth to Free Water in Pit:		(in.)
Depth to Saturated Soil:	>16"	(in.)

Secondary Indicators (2 or more required)
- Oxidized Root Channels in Upper 12 inches
- Water-Stained Leaves
- Local Soil Survey Data
- FAC-Neutral Test
- Other (Explain in Remarks)

Remarks: ABSENCE OF HYDROLOGY AND INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T4 P1

SOILS

Map Unit Name
(Series and Phase): Casco gravelly sand loam Drainage Class: excessively drained soil

Taxonomy (Subgroup): Typic Hapludalfs Field Observations Confirm Mapped Type? (circle) Yes **No**

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-10"	1	10YR3/2		LOAMY SAND
>10"	2	10YR3/3		LOAMY SAND

Hydric Soil Indicators:

Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS NOT MET AT DATA STATION BY ABSENCE OF HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	**Yes**	No
Wetland Hydrology Present?	Yes	**No**
Hydric Soils Present?	Yes	**No**

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	**No**

Remarks:
NON-WETLAND BASED ON ABSENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS.
TOE OF SLOPE ABOVE WETLAND.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/18/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Emergent wetland
Is the site significantly disturbed (Atypical Situation	Yes	No		(SECTION IA)
Is the area a potential Problem Area?	Yes	No	Transect ID:	T4
(If needed, explain on reverse.)			Plot ID:	P2

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Sambucus canadensis	Sub-canopy	FACW-	9.			
2.	Cephalanthus occidentalis	Sub-canopy	OBL	10.			
3.	Phalaris arundinacea	Herbaceous	FACW+	11.			
4.	Urtica dioica	Herbaceous	FAC+	12.			
5.	Impatiens pallida	Herbaceous	FACW	13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 100%

Remarks: CRITERIAN MET BY DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- X Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	0	(in.)	Secondary Indicators (2 or more required)
			Oxidized Root Channels in Upper 12 inches
Depth to Free Water in Pit:	8"	(in.)	Water-Stained Leaves
			Local Soil Survey Data
Depth to Saturated Soil:	surface	(in.)	FAC-Neutral Test
			Other (Explain in Remarks)

Remarks: PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T4P2

SOILS

Map Unit Name
(Series and Phase): Houghton muck, undrained Drainage Class: very poorly drained

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) **Yes** No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-16	1	10YR 2/1		MUCK

Hydric Soil Indicators:

X Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	**Yes**	No
Wetland Hydrology Present?	**Yes**	No
Hydric Soils Present?	**Yes**	No

	(Circle)	
Is this Sampling Point Within a Wetland?	**Yes**	No

Remarks:
WETLAND BASED ON PRESENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS. EAST OF CREEK.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/18/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	orested/Emergent
Is the site significantly disturbed (Atypical Situation	Yes	No		wetland (SECTION IA)
Is the area a potential Problem Area?	Yes	No	Transect ID:	T4
(If needed, explain on reverse.)			Plot ID:	P3

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Fraxinus pennsylvanica	Canopy	FACW	9.			
2.	Cephalantus occidentalis	Sub-canopy	OBL	10.			
3.	Viburnum lentago	Sub-canopy	FAC+	11.			
4.	Phalaris arundinacea	Herbaceous	FACW+	12.			
5.	Impatiens sp.	Herbaceous	FACW	13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 100%

Remarks: CRITERIAN MET BY DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- X Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	0	(in.)
Depth to Free Water in Pit:	8"	(in.)
Depth to Saturated Soil:	surface	(in.)

Secondary Indicators (2 or more required)
- Oxidized Root Channels in Upper 12 inches
- Water-Stained Leaves
- Local Soil Survey Data
- FAC-Neutral Test
- Other (Explain in Remarks)

Remarks: CRITERIAN MET BY PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T4P3

SOILS

Map Unit Name
(Series and Phase): Houghton muck, undrained Drainage Class: very poorly drained

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-16	1	10YR 2/1		MUCK

Hydric Soil Indicators:

X Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	No
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	No

Remarks:
WETLAND BASED ON PRESENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS. ADJACENT TO THE CREEK

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE Stud
Applicant/Owner: Lake Gage & Lime Lake Assoc. In
Investigator: Nathan Simons

Date: 05/18/05
County: Steuben
State: Indiana
Location: Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No
Is the site significantly disturbed (Atypical Situation	Yes	No
Is the area a potential Problem Area?	Yes	No
(If needed, explain on reverse.)		

Community ID: Creek
Transect ID: T4
Plot ID: P4

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	N/A			9.			
2.				10.			
3.				11.			
4.				12.			
5.				13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 0%

Remarks: ABSENCE OF EMERGENT VEGETATION

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- X Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	7	(in.)	Secondary Indicators (2 or more required)
			Oxidized Root Channels in Upper 12 inches
Depth to Free Water in Pit:	n/a	(in.)	Water-Stained Leaves
			Local Soil Survey Data
Depth to Saturated Soil:	n/a	(in.)	FAC-Neutral Test
			Other (Explain in Remarks)

Remarks: CRITERIAN MET BY PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T4P4

SOILS

Map Unit Name
(Series and Phase): Houghton muck, undrained Drainage Class: very poorly drained

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) Yes **No**

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0	1	N/A		SANDY GRAVEL

Hydric Soil Indicators:

Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: NON-SOIL.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	**No**
Wetland Hydrology Present?	**Yes**	**No**
Hydric Soils Present?	Yes	**No**

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	**No**

Remarks:
DATA POINT IS IN CREEK. THE CREEK IS A 'WATER OF THE U.S.'
NO DRIFT WAS EVIDENT ABOVE THE BANK. WATER LEVEL IS 10-12 IN. BELOW THE TOP OF BANK.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE Stud
Applicant/Owner: Lake Gage & Lime Lake Assoc. In
Investigator: Nathan Simons

Date: 05/18/05
County: Steuben
State: Indiana
Location: Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No
Is the site significantly disturbed (Atypical Situation	Yes	No
Is the area a potential Problem Area?	Yes	No
(If needed, explain on reverse.)		

Community ID: Emergent/Scrub wetland (SECTION IA)
Transect ID: T4
Plot ID: P5

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Fraxinus pennsylvanica	Canopy	FACW	9.			
2.	Juglans nigra	Canopy	FACU	10.			
3.	Acer negundo	Canopy	FACW-	11.			
4.	Sambucus canadensis	Sub-canopy	FACW-	12.			
5.	Cephalanthus occindentalis	Sub-canopy	OBL	13.			
6.	Phalaris arundinacea	Herbaceous	FACW+	14.			
7.	Impatiens sp.	Herbaceous	FACW	15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 86%

Remarks: CRITERIAN MET BY DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- X Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	0	(in.)
Depth to Free Water in Pit:	15	(in.)
Depth to Saturated Soil:	surface	(in.)

Secondary Indicators (2 or more required)
- Oxidized Root Channels in Upper 12 inches
- Water-Stained Leaves
- Local Soil Survey Data
- FAC-Neutral Test
- Other (Explain in Remarks)

Remarks: CRITERIAN MET BY PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T4P5

SOILS

Map Unit Name
(Series and Phase): Houghton muck, undrained Drainage Class: very poorly drained

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0	1	10YR 2/1		MUCK

Hydric Soil Indicators:

X Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	No
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

(Circle)
Is this Sampling Point Within a Wetland? Yes No

Remarks:
WETLAND BASED ON PRESENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS.
SLOPED MUCK WEST OF CREEK.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE Stud
Applicant/Owner: Lake Gage & Lime Lake Assoc. In
Investigator: Nathan Simons

Date: 05/18/05
County: Steuben
State: Indiana
Location: Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No
Is the site significantly disturbed (Atypical Situation	Yes	No
Is the area a potential Problem Area?	Yes	No
(If needed, explain on reverse.)		

Community ID: Upland woods
Transect ID: T4
Plot ID: P6

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Juglens nigra	Canopy	FACU*	9.			
2.	Fraxinus pennsylvanica	Canopy	FACW	10.			
3.	Acer negundo	Sub-canopy	FACW-	11.			
4.	Vitis riparia	Vine	FACW	12.			
5.	Alliaria petiolata	Herbaceous	FAC	13.			
6.	Rubus occidentalis	Herbaceous	UPL*	14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 67%

Remarks: CRITERIAN MET BY NON-DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	0	(in.)
Depth to Free Water in Pit:	> 16"	(in.)
Depth to Saturated Soil:	> 16"	(in.)

Secondary Indicators (2 or more required)
- Oxidized Root Channels in Upper 12 inches
- Water-Stained Leaves
- Local Soil Survey Data
- FAC-Neutral Test
- Other (Explain in Remarks)

Remarks: ABSENCE OF HYDROLOGY AND INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T4P6

SOILS

Map Unit Name
(Series and Phase): Oshtemo-Ormas loamy sands Drainage Class: Well drained

Taxonomy (Subgroup): Typic Hapludalfs Field Observations Confirm Mapped Type? (circle) **Yes** No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-16	1	10YR3/2		SANDY LOAM

Hydric Soil Indicators:

Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION NOT MET AT DATA STATION BY SOIL COLOR.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	**Yes**	No
Wetland Hydrology Present?	Yes	**No**
Hydric Soils Present?	Yes	**No**

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	**No**

Remarks:
NON-WETLAND BASED ON ABSENCE OF VEGETATION , HYDROLOGY, AND SOILS INDICATORS.
WOODED SLOPE

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE Stud
Applicant/Owner: Lake Gage & Lime Lake Assoc. In
Investigator: Nathan Simons

Date: 05/20/05
County: Steuben
State: Indiana
Location: Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No
Is the site significantly disturbed (Atypical Situation	Yes	No
Is the area a potential Problem Area?	Yes	No
(If needed, explain on reverse.)		

Community ID: Jpland field edge
Transect ID: T5
Plot ID: P1

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Populas deltoides	Canopy	FAC+	9.			
2.	Quescus alba	Canopy	FACU	10.			
3.	Lonicera morrowii	Sub-canopy	NI	11.			
4.	Rosa multiflora	Sub-canopy	FACU	12.			
5.	Bromus inermis	Herbaceous	UPL*	13.			
6.	Solidago altissima	Herbaceous	FACU	14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 0%

Remarks: NON- DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	0	(in.)
Depth to Free Water in Pit:		(in.)
Depth to Saturated Soil:	>16	(in.)

Secondary Indicators (2 or more required)
- Oxidized Root Channels in Upper 12 inches
- Water-Stained Leaves
- Local Soil Survey Data
- FAC-Neutral Test
- Other (Explain in Remarks)

Remarks: HYDROLOGY AND PRIMARY INDICATORS NOT PRESENT

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T5P1

SOILS

Map Unit Name
(Series and Phase): Casco gravelly sand loam Drainage Class: excessively drained soil

Taxonomy (Subgroup): Typic Hapludalfs Field Observations Confirm Mapped Type? (circle) **Yes** No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-6	1	10YR3/2		LOAMY GRAVELLY SAND
13-Jun	2	2.5Y4/2		LOAMY GRAVELY SAND

Hydric Soil Indicators:

Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS NOT MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

		(Circle)
Hydrophytic Vegetation Present?	Yes	**No**
Wetland Hydrology Present?	Yes	**No**
Hydric Soils Present?	Yes	**No**

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	**No**

Remarks:
NON WETLAND BASED ON ABSENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS.
GRASSY OLD FIELD SLOPE.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/20/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Emergent wetland
Is the site significantly disturbed (Atypical Situation	Yes	No		(SECTION IB)
Is the area a potential Problem Area?	Yes	No	Transect ID:	T5
(If needed, explain on reverse.)			Plot ID:	P2

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Salix nigra	Canopy	OBL	9.			
2.	Rosa multiflora	Sub-canopy	FACU	10.			
3.	Carex stricta	Herbaceous	OBL	11.			
4.	Calamagrostis canadensis	Herbaceous	OBL	12.			
5.	Phalaris arundinacea	Herbaceous	FACW	13.			
6.	Solidage altissima	Herbaceous	FACU	14.			
7.	Cirsium arvense	Herbaceous	FACU	15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 57%

Remarks: CRITERIAN MET BY DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- X Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	0	(in.)	
Depth to Free Water in Pit:	7	(in.)	
Depth to Saturated Soil:	surface	(in.)	

Secondary Indicators (2 or more required)
- Oxidized Root Channels in Upper 12 inches
- Water-Stained Leaves
- Local Soil Survey Data
- FAC-Neutral Test
- Other (Explain in Remarks)

Remarks:CRITERIAN MET BY PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T5P2

SOILS

Map Unit Name
(Series and Phase): Houghton muck, undrained Drainage Class: very poorly drained

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) Yes **No**

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-12	1	10YR 2/1		MUCK
>12		2.5YR 4/2		GRAVEL

Hydric Soil Indicators:

Histosol	Concretions
x Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	No
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	No

Remarks:
WETLAND BASED ON PRESENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS.
TERRACED FEN (DEGRADED) ABOVE CREEK

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE Stud
Applicant/Owner: Lake Gage & Lime Lake Assoc. In
Investigator: Nathan Simons

Date: 05/20/05
County: Steuben
State: Indiana
Location: Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Creek
Is the site significantly disturbed (Atypical Situation	Yes	No		
Is the area a potential Problem Area?	Yes	No	Transect ID:	T5
(If needed, explain on reverse.)			Plot ID:	P3

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	N/A			9.			
2.				10.			
3.				11.			
4.				12.			
5.				13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 0%

Remarks: ABSENCE OF EMERGENT VEGETATION

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- X inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	30	(in.)	Secondary Indicators (2 or more required)
			Oxidized Root Channels in Upper 12 inches
Depth to Free Water in Pit:	n/a	(in.)	Water-Stained Leaves
			Local Soil Survey Data
Depth to Saturated Soil:	n/a	(in.)	FAC-Neutral Test
			Other (Explain in Remarks)

Remarks: CRITERIAN MET BY PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T5P3

SOILS

Map Unit Name
(Series and Phase): Houghton muck, undrained Drainage Class: very poorly drained

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) Yes **No**

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0	1	N/A		SANDY GRAVEL

Hydric Soil Indicators:

Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: NON-SOIL.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	**No**
Wetland Hydrology Present?	Yes	**No**
Hydric Soils Present?	Yes	**No**

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	**No**

Remarks:
DATA POINT IS IN CREEK. THE CREEK IS A 'WATER OF THE U.S.'
WATER LEVEL IS HIGH DUE TO BEAVER ACTIVITY.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/20/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Emergent wetland
Is the site significantly disturbed (Atypical Situation	Yes	No		(SECTION IB)
Is the area a potential Problem Area?	Yes	No	Transect ID:	T5
(If needed, explain on reverse.)			Plot ID:	P4

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Cephalanthus occidentalis	Sub-canopy	OBL	9.			
2.	Phalaris arundinacea	Herbaceous	FACW+	10.			
3.	Carex stricta	Herbaceous	OBL	11.			
4.				12.			
5.				13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 100%

Remarks: CRITERIAN MET BY DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- X Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	10	(in.)	Secondary Indicators (2 or more required)
			Oxidized Root Channels in Upper 12 inches
Depth to Free Water in Pit:		(in.)	Water-Stained Leaves
			Local Soil Survey Data
Depth to Saturated Soil:		(in.)	FAC-Neutral Test
			Other (Explain in Remarks)

Remarks: CRITERIAN MET BY PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T5P4

SOILS

Map Unit Name
(Series and Phase): Riddles Drainage Class: WELL DRAINED

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
	1	10YR 2/1		muck

Hydric Soil Indicators:

X Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	No
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	No

Remarks:
WETLAND BASED ON PRESENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS.
NORTH SIDE OF CRREK IN REED CANARY GRASS MARSH CURRENTLY FLOODED BY BEAVER ACTIVITY.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/20/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Emergent wetland
Is the site significantly disturbed (Atypical Situation	Yes	No		(SECTION IB)
Is the area a potential Problem Area?	Yes	No	Transect ID:	T5
(If needed, explain on reverse.)			Plot ID:	P5

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Phragmites communis	Herbaceous	FACW+	9.			
2.	Phalaris arundinacea	Herbaceous	FACW+	10.			
3.				11.			
4.				12.			
5.				13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 100%

Remarks: CRITERIAN MET BY DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- X Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	0	(in.)	Secondary Indicators (2 or more required)
			Oxidized Root Channels in Upper 12 inches
Depth to Free Water in Pit:	12	(in.)	Water-Stained Leaves
			Local Soil Survey Data
Depth to Saturated Soil:	surface	(in.)	FAC-Neutral Test
			Other (Explain in Remarks)

Remarks: CRITERIAN MET BY PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T5P5

SOILS

Map Unit Name
(Series and Phase): Riddles Drainage Class: WELL DRAINED

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-16	1	10YR 2/1		MUCK

Hydric Soil Indicators:

X Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	No
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

Is this Sampling Point Within a Wetland? (Circle) Yes No

Remarks:
WETLAND BASED ON PRESENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS.
DEGRADED FEN.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/20/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Scrub wetland
Is the site significantly disturbed (Atypical Situation	Yes	No		(SECTION IB)
Is the area a potential Problem Area?	Yes	No	Transect ID:	T5
(If needed, explain on reverse.)			Plot ID:	P6

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Acer negundo	Canopy	FACW-	9.			
2.	Salix discolor	Canopy	FACW	10.			
3.	Viburnum lentago	Sub-canopy	FAC+	11.			
4.	Sambucus canadensis	Sub-canopy	FACW-	12.			
5.	Cornus amomum	Sub-canopy	FACW+	13.			
6.	Phalaris arundinacea	Herbaceous	FACW+	14.			
7.	Phragmites australis	Herbaceous	FACW+	15.			
8.	Impatiens sp.	Herbaceous	FACW	16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 100%

Remarks: CRITERIAN MET BY DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- X Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	0	(in.)
Depth to Free Water in Pit:	12	(in.)
Depth to Saturated Soil:	surface	(in.)

Secondary Indicators (2 or more required)
- Oxidized Root Channels in Upper 12 inches
- Water-Stained Leaves
- Local Soil Survey Data
- FAC-Neutral Test
- Other (Explain in Remarks)

Remarks: CRITERIAN MET BY PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T5P6

SOILS

Map Unit Name
(Series and Phase): Houghton muck, undrained Drainage Class: very poorly drained

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) [Yes] No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-16	1	10YR 2/1		MUCK

Hydric Soil Indicators:

X Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	[Yes]	No
Wetland Hydrology Present?	[Yes]	No
Hydric Soils Present?	[Yes]	No

	(Circle)	
Is this Sampling Point Within a Wetland?	[Yes]	No

Remarks:
WETLAND BASED ON PRESENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS.
BRUSHY EDGE IN WETLAND

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/20/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Upland woods
Is the site significantly disturbed (Atypical Situation	Yes	No		
Is the area a potential Problem Area?	Yes	No	Transect ID:	T5
(If needed, explain on reverse.)			Plot ID:	P7

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Juglans nigra	Canopy	FACU	9.	Cryptotaenia canadensis	Herbaceous	FAC
2.	Prunus serotina	Canopy	FACU	10.			
3.	Acer negundo	Canopy	FACW-	11.			
4.	Lonicera morrowi	Sub-canopy	NI	12.			
5.	Acer negundo	Sub-canopy	FACW-	13.			
6.	Rosa multiflora	Sub-canopy	FACU	14.			
7.	Alliaria petiolata	Herbaceous	FAC	15.			
8.	Rumex obtusifolius	Herbaceous	FACW-	16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 56%

Remarks: CRITERIAN MET BY DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	0	(in.)	Secondary Indicators (2 or more required)
			Oxidized Root Channels in Upper 12 inches
Depth to Free Water in Pit:		(in.)	Water-Stained Leaves
			Local Soil Survey Data
Depth to Saturated Soil:	>16	(in.)	FAC-Neutral Test
			Other (Explain in Remarks)

Remarks: HYDROLOGY AND PRIMARY INDICATORS NOT PRESENT

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T5P7

SOILS

Map Unit Name
(Series and Phase): Riddles sandy loam Drainage Class: well drained

Taxonomy (Subgroup): Typic Hapludalfs Field Observations Confirm Mapped Type? (circle) **Yes** No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-4	1	10YR 3/2		LOAMY SAND
>4	2	10YR 4/3		LOAMY SAND

Hydric Soil Indicators:

Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS NOT MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	**Yes**	No
Wetland Hydrology Present?	Yes	**No**
Hydric Soils Present?	Yes	**No**

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	**No**

Remarks:
NON WETLAND BASED ON ABSENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS.
WOODED SLOPE ABOVE WETLAND.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/20/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Upland old field
Is the site significantly disturbed (Atypical Situation	Yes	No		
Is the area a potential Problem Area?	Yes	No	Transect ID:	T6
(If needed, explain on reverse.)			Plot ID:	P1

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Prunus serotina	Canopy	FACU	9.			
2.	Acer negundo	Canopy	FACW-	10.			
3.	Lonicera morrowii	Sub-canopy	NI	11.			
4.	Bromus inermis	Herbaceous	UPL*	12.			
5.	Poa pratensis	Herbaceous	FAC-	13.			
6.	Equesetum hyemale	Herbaceous	FACW-	14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 33%

Remarks: NON- DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:
- Depth of Surface Water: (in.)
- Depth to Free Water in Pit: (in.)
- Depth to Saturated Soil: (in.)

Secondary Indicators (2 or more required)
- Oxidized Root Channels in Upper 12 inches
- Water-Stained Leaves
- Local Soil Survey Data
- FAC-Neutral Test
- Other (Explain in Remarks)

Remarks: NON- PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS. COULD NOT DIG PIT.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T6P1

SOILS

Map Unit Name
(Series and Phase): Riddles sandy loam Drainage Class: well drained

Taxonomy (Subgroup): Typic Hapludalfs Field Observations Confirm Mapped Type? (circle) Yes **No**

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-2	1	10YR 3/2		

Hydric Soil Indicators:

Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS NOT MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	**No**
Wetland Hydrology Present?	Yes	**No**
Hydric Soils Present?	Yes	**No**

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	**No**

Remarks:
NOT A WETLAND BASED ON ABSENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS.
RAILROAD GRADE/SLOPE ABOVE WETLAND

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/20/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Emergent wetland
Is the site significantly disturbed (Atypical Situation)	Yes	No		(SECTION IC)
Is the area a potential Problem Area?	Yes	No	Transect ID:	T6
(If needed, explain on reverse.)			Plot ID:	P2

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Phalaris arundinacea	Herbaceous	FACW+	9.			
2.	Calamagrostis canadensis	Herbaceous	OBL	10.			
3.	Carex stricta	Herbaceous	OBL	11.			
4.	Caltha palustris	Hervaceous	OBL	12.			
5.	Aster firmus	Herbaceous	FACW+	13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 100%

Remarks: CRITERIAN MET BY DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- X Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	0.5	(in.)	Secondary Indicators (2 or more required)
			Oxidized Root Channels in Upper 12 inches
Depth to Free Water in Pit:		(in.)	Water-Stained Leaves
			Local Soil Survey Data
Depth to Saturated Soil:		(in.)	FAC-Neutral Test
			Other (Explain in Remarks)

Remarks: CRITERIAN MET BY PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T6P2

SOILS

Map Unit Name
(Series and Phase): HOUGHTON MUCK Drainage Class: very poorly drained

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-16	1			MUCK

Hydric Soil Indicators:

x Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	No
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	No

Remarks:
WETLAND BASED ON PRESENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS.
WETLAND IS NARROWED JUST UPSTREAM BY CUT THROUGH OLD RAILROAD GRADE.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE Stud
Applicant/Owner: Lake Gage & Lime Lake Assoc. In
Investigator: Nathan Simons

Date: 05/20/05
County: Steuben
State: Indiana
Location: Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site? [Yes] No
Is the site significantly disturbed (Atypical Situation) [Yes] No
Is the area a potential Problem Area? Yes [No]
(If needed, explain on reverse.)

Community ID: Emergent wetland (SECTION IC)
Transect ID: T6
Plot ID: P3

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Phalaris arundinacea	Herbaceous	FACW+	9.			
2.				10.			
3.				11.			
4.				12.			
5.				13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 100%

Remarks: CRFITERIAN MET BY DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- X Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:
- Depth of Surface Water: 8 (in.)
- Depth to Free Water in Pit: (in.)
- Depth to Saturated Soil: (in.)

Secondary Indicators (2 or more required)
- Oxidized Root Channels in Upper 12 inches
- Water-Stained Leaves
- Local Soil Survey Data
- FAC-Neutral Test
- Other (Explain in Remarks)

Remarks: CRFITERIAN MET BY PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T6P3

SOILS

Map Unit Name
(Series and Phase): HOUGHTON MUCK Drainage Class: very poorly drained

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-16	1			MUCK

Hydric Soil Indicators:

x Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	No
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	No

Remarks:
NOT A WETLAND BASED ON PRESENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS. SAME WETLAND PONDED BY BEAVER ACTIVITY.

Approved by HQUSACE 3/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/20/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Creek
Is the site significantly disturbed (Atypical Situation	Yes	No		
Is the area a potential Problem Area?	Yes	No	Transect ID:	T6
(If needed, explain on reverse.)			Plot ID:	P4

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	N/A			9.			
2.				10.			
3.				11.			
4.				12.			
5.				13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 0%

Remarks: ABSENCE OF EMERGENT VEGETATION

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- X Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	>30	(in.)	
Depth to Free Water in Pit:	n/a	(in.)	
Depth to Saturated Soil:	n/a	(in.)	

Secondary Indicators (2 or more required)
- Oxidized Root Channels in Upper 12 inches
- Water-Stained Leaves
- Local Soil Survey Data
- FAC-Neutral Test
- Other (Explain in Remarks)

Remarks: CRITERIAN MET BY PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T6P4

SOILS

Map Unit Name
(Series and Phase): Houghton muck Drainage Class: very poorly drained

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? Yes (circle) **No**

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0	1	N/A		SAND and GRAVEL

Hydric Soil Indicators:

Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: NON-SOIL.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	**No**
Wetland Hydrology Present?	**Yes**	**No**
Hydric Soils Present?	Yes	**No**

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	**No**

Remarks:
DATA POINT IS IN CREEK. THE CREEK IS A 'WATER OF THE U.S.'
WATER LEVEL IS HIGH DUE TO BEAVER ACTIVITY.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/20/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Ditch
Is the site significantly disturbed (Atypical Situation	Yes	No		
Is the area a potential Problem Area?	Yes	No	Transect ID:	T6
(If needed, explain on reverse.)			Plot ID:	P5

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	N/A			9.			
2.				10.			
3.				11.			
4.				12.			
5.				13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 0%

Remarks: ABSENCE OF EMERGENT VEGETATION

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- X Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	>24	(in.)	Secondary Indicators (2 or more required)
			Oxidized Root Channels in Upper 12 inches
Depth to Free Water in Pit:	n/a	(in.)	Water-Stained Leaves
			Local Soil Survey Data
Depth to Saturated Soil:	n/a	(in.)	FAC-Neutral Test
			Other (Explain in Remarks)

Remarks: CRITERIAN MET BY PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T6P5

SOILS

Map Unit Name
(Series and Phase): Houghton muck, undrained Drainage Class: very poorly drained

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) **Yes** No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0	1	N/A		MUCK

Hydric Soil Indicators:

x Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: CRITERIAN IS MET BY PRESENCE OF HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	**No**
Wetland Hydrology Present?	**Yes**	No
Hydric Soils Present?	**Yes**	No

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	**No**

Remarks:
DATA POINT IS IN A DITCH NEAR THE CONFLUENCE WITH THE CREEK. THE DITCH PARTIALLY DRAINS THE WETLAND FINGER TO THE NORTH. THE DITCH IS A 'WATER OF THE U.S.'
WATER LEVEL IN HIGH DUE TO BEAVER ACTIVITY. COULD NOT REACH THE 'LAND' BETWEEN THE DITCH AND CREEK.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/20/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Emergent wetland
Is the site significantly disturbed (Atypical Situation	Yes	No		(SECTION IC)
Is the area a potential Problem Area?	Yes	No	Transect ID:	T6
(If needed, explain on reverse.)			Plot ID:	P6

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Phalaris arundinacea	Herbaceous	FACW+	9.			
2.	Calamagrostis canadensis	Herbaceous	OBL	10.			
3.	Carex stricta	Herbaceous	OBL	11.			
4.	Aster puniceous	Herbaceous	FACW+	12.			
5.				13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 100%

Remarks: CRITERION MET BY DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- X Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	1	(in.)	Secondary Indicators (2 or more required)
			Oxidized Root Channels in Upper 12 inches
Depth to Free Water in Pit:		(in.)	Water-Stained Leaves
			Local Soil Survey Data
Depth to Saturated Soil:		(in.)	FAC-Neutral Test
			Other (Explain in Remarks)

Remarks: CRITERION MET BYPRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T6P6

SOILS

Map Unit Name
(Series and Phase): HOUGHTON MUCK Drainage Class: very poolr drained

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-16	1	10YR 2/1		MUCK

Hydric Soil Indicators:

x Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	No
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	No

Remarks:
WETLAND BASED ON PRESENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS.
WEST OF DITCH.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/20/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Upland woods
Is the site significantly disturbed (Atypical Situation	Yes	No		
Is the area a potential Problem Area?	Yes	No	Transect ID:	T6
(If needed, explain on reverse.)			Plot ID:	P7

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Carya ovata	Canopy	FACU	9.			
2.	Quercus velutina	Canopy	UPL*	10.			
3.	Prunus serotina	Sub-canopy	FACU	11.			
4.	Elaeagnus umbellata	Sub-canopy	UPL*	12.			
5.	Fraxinus americana	Sub-canopy	FACU	13.			
6.	Poa compressa	Herbaceous	FACU+	14.			
7.	Galium circaezans	Herbaceous	FACU-	15.			
8.	Solidago caesia	Herbaceous	FACU	16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 0%

Remarks: NON -DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:		(in.)	Secondary Indicators (2 or more required)
			Oxidized Root Channels in Upper 12 inches
Depth to Free Water in Pit:		(in.)	Water-Stained Leaves
			Local Soil Survey Data
Depth to Saturated Soil:	>12	(in.)	FAC-Neutral Test
			Other (Explain in Remarks)

Remarks:NON-PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T6P7

SOILS

Map Unit Name
(Series and Phase): CASCO GRAVELLY SNADY LC Drainage Class:SOMEWHAT EXCESSIVELY DRAINED

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) **Yes** No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-3	1	10YR 3/2		LOAMY SANDY GRAVEL
3-12"	2	10 YR 5/4		CLAYEY GRAVEL

Hydric Soil Indicators:

Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS NOT MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

		(Circle)
Hydrophytic Vegetation Present?	Yes	No
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	No

Remarks:
NOT A WETLAND BASED ON ABSENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS.
OAK UPLAND PENINSULA

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/20/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Scrub wetland
Is the site significantly disturbed (Atypical Situation	Yes	No		(SECTION IC)
Is the area a potential Problem Area?	Yes	No	Transect ID:	T6
(If needed, explain on reverse.)			Plot ID:	P8

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Viburnum lentago	Sub-canopy	FAC+	9.	Lathyrus palustris	Herbaceous	FACW
2.	Cornus sericea	Sub-canopy	FACW	10.	Toxicodendron radicans	Herbaceous	FAC+
3.	Toxicodendron vernix	Sub-canopy	OBL	11.			
4.	Cornus racemosa	Sub-canopy	FACW-	12.			
5.	Rosa multiflora	Sub-canopy	FACU	13.			
6.	Carex stricta	Herbaceous	OBL	14.			
7.	Phalaris arundinacea	Herbaceous	FACW+	15.			
8.	Onoclea sensibilis	Herbaceous	FACW	16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 90%

Remarks: CRITERION MET BY DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- X Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	0	(in.)
Depth to Free Water in Pit:	13	(in.)
Depth to Saturated Soil:	surface	(in.)

Secondary Indicators (2 or more required)
- Oxidized Root Channels in Upper 12 inches
- Water-Stained Leaves
- Local Soil Survey Data
- FAC-Neutral Test
- Other (Explain in Remarks)

Remarks: CRITERION MET BY PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T6P8

SOILS

Map Unit Name
(Series and Phase): PALMS MUCK Drainage Class: very poorly drained

Taxonomy (Subgroup): Terric Medisaprists Field Observations Confirm Mapped Type? (circle) Yes **No**

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-10	1	N 2.5/0		MUCK
>10	2	N 6/0		CLAYEY GRAVEL

Hydric Soil Indicators:

Histosol	Concretions
x Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	No
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	No

Remarks:
WETLAND BASED ON PRESENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS.
SHRUBBY WETLAND. PART OF FINGER NORTHWEST OF MAIN CHANNEL

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/20/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Emergent wetland
Is the site significantly disturbed (Atypical Situation	Yes	No		(SECTION IC)
Is the area a potential Problem Area?	Yes	No	Transect ID:	T6
(If needed, explain on reverse.)			Plot ID:	P9

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Carex stricta	Herbaceous	OBL	9.			
2.	Phalaris arundinacea	Herbaceous	FACW+	10.			
3.	Calamagrostis canadensis	Herbaceous	OBL	11.			
4.	Lathyrus palustris	Herbaceous	FACW	12.			
5.	Solidago gigantea	Herbaceous	FACW	13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 100%

Remarks: CRITERION MET BY DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Field Observations:
- Depth of Surface Water: 6 (in.)
- Depth to Free Water in Pit: (in.)
- Depth to Saturated Soil: (in.)

Wetland Hydrology Indicators

Primary Indicators
- X Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
- Oxidized Root Channels in Upper 12 inches
- Water-Stained Leaves
- Local Soil Survey Data
- FAC-Neutral Test
- Other (Explain in Remarks)

Remarks: CRITERION MET BY PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T6P9

SOILS

Map Unit Name
(Series and Phase): Houghton muck, undrained Drainage Class: very poorly drained

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-16	1	10YR 2/1		MUCK

Hydric Soil Indicators:

X Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	No
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	No

Remarks:
WETLAND BASED ON PRESENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS. SEDGE MARSH...COMMUNITY CHANGE IN SAME WETLAND. WATER LEVEL IS HIGH DUE TO BEAVER ACTIVITY.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/20/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Scrub wetland
Is the site significantly disturbed (Atypical Situation	Yes	No		(SECTION IC)
Is the area a potential Problem Area?	Yes	No	Transect ID:	T6A
(If needed, explain on reverse.)			Plot ID:	P10

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Cornus sericea	Sub-canopy	FACW-	9.			
2.	Toxicodendron vernix	Sub-canopy	OBL	10.			
3.	Carex stricta	Herbaceous	OBL	11.			
4.	Calamagrostis canadensis	Herbaceous	OBL	12.			
5.	Thelypteris palustris	Herbaceous	FACW+	13.			
6.	Aster firmus	Herbaceous	FACW	14.			
7.	Lathyrus palustris	Herbaceous	FACW	15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 100%

Remarks: CRITERION MET BY DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- X Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	0-1	(in.)	Secondary Indicators (2 or more required)
Depth to Free Water in Pit:		(in.)	Oxidized Root Channels in Upper 12 inches Water-Stained Leaves
Depth to Saturated Soil:		(in.)	Local Soil Survey Data FAC-Neutral Test Other (Explain in Remarks)

Remarks: CRITERION MET BY PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T6AP10

SOILS

Map Unit Name
(Series and Phase): Houghton muck, undrained Drainage Class: very poorly drained

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-16	1	10YR 2/1		MUCK

Hydric Soil Indicators:

X Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	No
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	No

Remarks:
WETLAND BASED ON PRESENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS.
EDGE OF SHRUBBY THICKET AT TOPO BREAK IN SAME WETLAND.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/20/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Scrub wetland
Is the site significantly disturbed (Atypical Situation	Yes	No		(SECTION IC)
Is the area a potential Problem Area?	Yes	No	Transect ID:	T6
(If needed, explain on reverse.)			Plot ID:	P11

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Toxicondendron vernix	Sub-canopy	OBL	9.	Solidago canadensis	Herbaceous	FACU
2.	Cornus racemosa	Sub-canopy	FACW	10.			
3.	Ilex verticillata	Sub-canopy	FACW+	11.			
4.	Potentilla fruticosa	Sub-canopy	FACW	12.			
5.	Carex stricta	Herbaceous	OBL	13.			
6.	Calamagrostis canadensis	Herbaceous	OBL	14.			
7.	Aster firmus	Herbaceous	FACW+	15.			
8.	Solidago patula	Herbaceous	OBL	16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 89%

Remarks: CRITERION MET BY DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Field Observations:

Depth of Surface Water:	0	(in.)
Depth to Free Water in Pit:	8	(in.)
Depth to Saturated Soil:	surface	(in.)

Wetland Hydrology Indicators

Primary Indicators
- Inundated
- X Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
- Oxidized Root Channels in Upper 12 inches
- Water-Stained Leaves
- Local Soil Survey Data
- FAC-Neutral Test
- Other (Explain in Remarks)

Remarks: CRITERION MET BY PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T6P11

SOILS

Map Unit Name
(Series and Phase): Houghton muck, undrained Drainage Class: very poorly drained

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0	1	10YR 2/1		MUCK

Hydric Soil Indicators:

X Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	No
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	No

Remarks:
WETLAND BASED ON PRESENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS.
FEN (SHRUBBY)

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/20/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .36, T.38 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Upland woods
Is the site significantly disturbed (Atypical Situation	Yes	No		
Is the area a potential Problem Area?	Yes	No	Transect ID:	T6
(If needed, explain on reverse.)			Plot ID:	P12

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Prunus serotina	Canopy	FACU	9.			
2.	Quercus alba	Canopy	FACU	10.			
3.	Cornus racemosa	Sub-canopy	FACW-	11.			
4.	Lonicera tatarica	Sub-canopy	FACU*	12.			
5.	Viburnum lentago	Sub-canopy	FAC+	13.			
6.	Bromus inermis	Herbaceous	UPL*	14.			
7.	Lonicera tatarica	Sub-canopy	FACU*	15.			
8.	Rosa multiflora	Herbaceous	FACU	16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 25%

Remarks: NON- DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:		(in.)	Secondary Indicators (2 or more required)
			Oxidized Root Channels in Upper 12 inches
Depth to Free Water in Pit:		(in.)	Water-Stained Leaves
			Local Soil Survey Data
Depth to Saturated Soil:	>16	(in.)	FAC-Neutral Test
			Other (Explain in Remarks)

Remarks: ABSAENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T6P12

SOILS

Map Unit Name
(Series and Phase): Riddles Drainage Class: well drained

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) Yes **No**

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-10	1	10YR 3/2		gravelly loam

Hydric Soil Indicators:

Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS NOT MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	**No**
Wetland Hydrology Present?	Yes	**No**
Hydric Soils Present?	Yes	**No**

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	**No**

Remarks:
NOT A WETLAND BASED ON ABSENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS.
SCRUB SLOPE ABOVE WETLAND

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/20/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .1, T.37 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Upland Forest
Is the site significantly disturbed (Atypical Situation	Yes	No		
Is the area a potential Problem Area?	Yes	No	Transect ID:	T9
(If needed, explain on reverse.)			Plot ID:	P1

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Carya ovalis	Canopy	FACU	9.			
2.	Prunus serotina	Canopy	FACU	10.			
3.	Acer saccharum	Canopy	FACU	11.			
4.	Ulmus ruba	Sub-canopy	FAC	12.			
5.	Parthenocisus quinquefolia	Herbaceous	FAC-	13.			
6.	Prenanthes alba	Herbaceous	FACU	14.			
7.	Circaea lutetiana	Herbaceous	FACU	15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 14%

Remarks: NON- DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:		(in.)	Secondary Indicators (2 or more required)
			Oxidized Root Channels in Upper 12 inches
Depth to Free Water in Pit:		(in.)	Water-Stained Leaves
			Local Soil Survey Data
Depth to Saturated Soil:	>16	(in.)	FAC-Neutral Test
			Other (Explain in Remarks)

Remarks: ABSENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T9P1

SOILS

Map Unit Name
(Series and Phase): OSHTEMO-ORMAS LOAMY SAND Drainage Class: well drained

Taxonomy (Subgroup): Typic/Arenic Hapludalfs Field Observations Confirm Mapped Type? (circle) Yes **No**

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-6	1	10 YR 3/2		sandy loam
6-9"	2	10 YR 3/2		gravelly loam
9-16	3	10 YR 4/4		gravelly clay loam

Hydric Soil Indicators:

Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS NOT MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	**No**
Wetland Hydrology Present?	Yes	**No**
Hydric Soils Present?	Yes	**No**

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	**No**

Remarks:
NOT A WETLAND BASED ON ABSENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS.
WOODED SLOPE

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/20/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec . 1, T.37 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Emergent wetland
Is the site significantly disturbed (Atypical Situation	Yes	No		(SECTION II)
Is the area a potential Problem Area?	Yes	No	Transect ID:	T9
(If needed, explain on reverse.)			Plot ID:	P2

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Phalaris arundinacea	Herbaceous	FACW+	9.			
2.	Impatiens pallida	Herbaceous	FACW	10.			
3.	Urtica dioica	Herbaceous	FAC+	11.			
4.	Polygonum sagittatum	Herbaceous	OBL	12.			
5.				13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 100%

Remarks: CRITERION MET BY DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Wetland Hydrology Indicators

Primary Indicators
- Inundated
- X Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	0	(in.)	
Depth to Free Water in Pit:	14	(in.)	
Depth to Saturated Soil:	surface	(in.)	

Secondary Indicators (2 or more required)
- X Oxidized Root Channels in Upper 12 inches
- Water-Stained Leaves
- Local Soil Survey Data
- FAC-Neutral Test
- Other (Explain in Remarks)

Remarks: CRITERION MET BY PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T9P2

SOILS

Map Unit Name
(Series and Phase): Riverdale loamy sand Drainage Class: somewhat poorly drained

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) Yes **No**

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-9	1	10YR 3/1		MUCK
9-11"	2	2.5Y 5/3		sand
11-18"	3	2.5Y 2.5/1		sandy w/organics

Hydric Soil Indicators:

	Histosol		Concretions
X	Histic Epipedon		High Organic Content in Surface Layer in Sandy Soils
	Sulfidic Odor	X	Organic Streaking in Sandy Soils
	Aquic Moisture Regime		Listed on Local Hydric Soils List
	Reducing Conditions		Listed on National Hydric Soils List
	Gleyed or Low-Chroma Colors		Other (Explain in Remarks)

Remarks: SOIL CRITERION IS MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	No
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	No

Remarks:
WETLAND BASED ON PRESENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS.
EMERGENT FLAT ON EDGE OF STREAM CHANNEL. NO INDICATION OF STREAM OVERFLOW!

DATA FORM

ROUTINE WETLAND DETERMINATION

(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/20/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .1, T.37 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Creek
Is the site significantly disturbed (Atypical Situation	Yes	No		
Is the area a potential Problem Area?	Yes	No	Transect ID:	T9
(If needed, explain on reverse.)			Plot ID:	P3

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Vallisneria americana	Herbaceous	OBL	9.			
2.				10.			
3.				11.			
4.				12.			
5.				13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 100%

Remarks: CRITERION MET BY DOMINANCE OF HYDROPHYTIC VEGETATION

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):

- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators

- X Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	1-6 INCHES	(in.)
Depth to Free Water in Pit:		(in.)
Depth to Saturated Soil:		(in.)

Secondary Indicators (2 or more required)

- Oxidized Root Channels in Upper 12 inches
- Water-Stained Leaves
- Local Soil Survey Data
- FAC-Neutral Test
- Other (Explain in Remarks)

Remarks: CRITERIAN MET BY PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T9P3

SOILS

Map Unit Name
(Series and Phase): Riverdale loamy sand Drainage Class: somewhat poorly drained

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) Yes **No**

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0	1	N/A		SAND and GRAVEL

Hydric Soil Indicators:

Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: NON-SOIL.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	No
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	**No**

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	**No**

Remarks:
DATA POINT IS IN CREEK. THE CREEK IS A 'WATER OF THE U.S.'

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/20/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec . 1, T.37 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Upland Forest
Is the site significantly disturbed (Atypical Situation	Yes	No		
Is the area a potential Problem Area?	Yes	No	Transect ID:	T9
(If needed, explain on reverse.)			Plot ID:	P4

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Carya ovata	Canopy	FACU	9.			
2.	Fraxinus pennsylvanica	Canopy	FACW	10.			
3.	Hamamelis virginiana	Sub-canopy	FACU	11.			
4.	Ligustrum obtusifolium	Sub-canopy	UPL*	12.			
5.	Berberis vulgaris	Sub-canopy	FACU	13.			
6.	Parthenocissus quinquefolia	Herbaceous	FAC-	14.			
7.	Isopyrum biternatum	Herbaceous	FAC	15.			
8.	Smilacina stellata	Herbaceous	FAC-	16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 25%

Remarks: NON- DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:		(in.)	Secondary Indicators (2 or more required)
			Oxidized Root Channels in Upper 12 inches
Depth to Free Water in Pit:		(in.)	Water-Stained Leaves
			Local Soil Survey Data
Depth to Saturated Soil:	>16	(in.)	FAC-Neutral Test
			Other (Explain in Remarks)

Remarks: ABSENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T9P4

SOILS

Map Unit Name
(Series and Phase): Casco sandy gravelly loam Drainage Class: somewhat excessively drained

Taxonomy (Subgroup): Typic Hapludalfs Field Observations Confirm Mapped Type? (circle) Yes **No**

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-6	1	10 YR 3/2		gravelly loam
6-16"	2	10YR 4/4		cobbly loam

Hydric Soil Indicators:

Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS NOT MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	**No**
Wetland Hydrology Present?	Yes	**No**
Hydric Soils Present?	Yes	**No**

(Circle)
Is this Sampling Point Within a Wetland? Yes **No**

Remarks:
NOT A WETLAND BASED ON PRESENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS.
STEEP WOODED BANK

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/20/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec . 1, T.37 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Upland Forest
Is the site significantly disturbed (Atypical Situation	Yes	No		
Is the area a potential Problem Area?	Yes	No	Transect ID:	T10
(If needed, explain on reverse.)			Plot ID:	P1

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Quercus alba	Canopy	FACU	9.			
2.	Carya ovata	Canopy	FACU	10.			
3.	Prunus serotina	Canopy	FACU	11.			
4.	Acer saccharum	Sub canopy	FACU	12.			
5.	Acer saccharum	Herbaceous	FACU	13.			
6.	Prenanthes alba	Herbaceous	FACU	14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 0%

Remarks: NON- DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:		(in.)	Secondary Indicators (2 or more required)
			Oxidized Root Channels in Upper 12 inches
Depth to Free Water in Pit:		(in.)	Water-Stained Leaves
			Local Soil Survey Data
Depth to Saturated Soil:	>16	(in.)	FAC-Neutral Test
			Other (Explain in Remarks)

Remarks: ABSENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T10P1

SOILS

Map Unit Name
(Series and Phase): OSHTEMO-ORMAS LOAMY SANDS Drainage Class: well drained

Taxonomy (Subgroup): Typic/Arenic Hapludalfs Field Observations Confirm Mapped Type? (circle) **Yes** No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-6	1	10 YR 3/2		sandy loam
6-12"	2	10 YR 4/3		sandy loam

Hydric Soil Indicators:

Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS NOT MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

		(Circle)
Hydrophytic Vegetation Present?	Yes	**No**
Wetland Hydrology Present?	Yes	**No**
Hydric Soils Present?	Yes	**No**

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	**No**

Remarks:
NOT A WETLAND BASED ON PRESENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS.
YOUNG FORESTED FLAT ABOVE OLD STREAM MEANDER/MILL POND WETLAND.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/20/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec . 1, T.37 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Forested wetland
Is the site significantly disturbed (Atypical Situation	Yes	No		(SECTION III)
Is the area a potential Problem Area?	Yes	No	Transect ID:	T10
(If needed, explain on reverse.)			Plot ID:	P2

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Populus deltoides	Canopy	FAC+	9.			
2.	Ulmus rubra	Canopy	FAC	10.			
3.	Ulmus rubra	Sub canopy	FAC	11.			
4.				12.			
5.				13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 100%

Remarks: CRITERION MET BY DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- X Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	0	(in.)	Secondary Indicators (2 or more required)
			Oxidized Root Channels in Upper 12 inches
Depth to Free Water in Pit:	10	(in.)	X Water-Stained Leaves
			Local Soil Survey Data
Depth to Saturated Soil:	surface	(in.)	FAC-Neutral Test
			Other (Explain in Remarks)

Remarks: CRITERION MET BY HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T10P2

SOILS

Map Unit Name
(Series and Phase): OSHTEMO-ORMAS LOAMY SANDS Drainage Class: well drained

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) Yes **No**

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-6	1	10YR 2/1		sandy loam
6-12"	2	10YR 4/1		gravelly sand

Hydric Soil Indicators:

Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
X Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION IS MET AT DATA STATION BY HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	No
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	No

Remarks:
WETLAND BASED ON PRESENCE OF HYDROPHYTIC VEGETATION, HYDRIC SOILS, AND HYDROLOGY INDICATORS.
OLD CREEK CHANNEL WITHIN FORMER MILL POND.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/20/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec. 1, T.37 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Scrub wetland
Is the site significantly disturbed (Atypical Situation	Yes	No		(SECTION III)
Is the area a potential Problem Area?	Yes	No	Transect ID:	T10A
(If needed, explain on reverse.)			Plot ID:	P3

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Ulmus americana	Canopy	FACW-	9.	Thelypteris palustris	Herbaceous	FACW+
2.	Acer negundo	Canopy	FACW-	10.			
3.	Cephalanthus occidentalis	Sub-canopy	OBL	11.			
4.	Lindera benzoin	Sub-canopy	FACW-	12.			
5.	Viburnum lentago	Sub-canopy	FAC+	13.			
6.	Acer saccharinum	Sub-canopy	FACW	14.			
7.	Lysimachia nummularia	Herbaceous	FACW+	15.			
8.	Iris virginica	Herbaceous	OBL	16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 100%

Remarks: CRITERION MET BY DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- X Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	0	(in.)	Secondary Indicators (2 or more required)
			Oxidized Root Channels in Upper 12 inches
Depth to Free Water in Pit:	7	(in.)	X Water-Stained Leaves
			Local Soil Survey Data
Depth to Saturated Soil:	surface	(in.)	FAC-Neutral Test
			Other (Explain in Remarks)

Remarks: CRITERION MET BY PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T10AP3

SOILS

Map Unit Name
(Series and Phase): Oshtemo-Ormas loamy sands Drainage Class: weel drained

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) Yes **No**

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-9	1	10YR 2/1		MUCK
9-16"	2	2.5Y 5/2		GRAVELLY SAND

Hydric Soil Indicators:

	Histosol		Concretions
X	Histic Epipedon		High Organic Content in Surface Layer in Sandy Soils
	Sulfidic Odor		Organic Streaking in Sandy Soils
	Aquic Moisture Regime		Listed on Local Hydric Soils List
	Reducing Conditions		Listed on National Hydric Soils List
	Gleyed or Low-Chroma Colors		Other (Explain in Remarks)

Remarks: CRITERION MET BY PRESENCE OF HYDRIC SOIL INDICATORS.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	No
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	No

Remarks:
DATA POINT IS IN WETLAND BASED ON PRESENCE OF HYDROPHYTIC VEGETATION, WETLAND HYDROLOGY, AND HYDRIC SOILS. DATA POINT IS 'DOWNSTREAM' SIDE OF OLD MILL POND DAM IN ORIGINAL CREEK CHANNEL.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/20/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec. 1, T.37 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Upland Forest
Is the site significantly disturbed (Atypical Situation	Yes	No		
Is the area a potential Problem Area?	Yes	No	Transect ID:	T10
(If needed, explain on reverse.)			Plot ID:	P4

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	Carya ovata	Canopy	FACU	9.	Geranium bicknellii	Herbaceous	UPL
2.	Juglans nigra	Canopy	FACU	10.			
3.	Quercus rubra	Canopy	FACU	11.			
4.	Crataegus sp.	Sub-canopy	FACU*	12.			
5.	Liguisticum obtusifolium	Sub-canopy	FAC-	13.			
6.	Lonicera morrowii	Sub-canopy	NI	14.			
7.	Alliaria petiolata	Herbaceous	FAC	15.			
8.	Parthenocissus quinquefolia	Herbaceous	FAC-	16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 11%

Remarks: NON-DOMINANCE OF HYDROPHYTIC VEGETATION.

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:		(in.)	Secondary Indicators (2 or more required)
			Oxidized Root Channels in Upper 12 inches
Depth to Free Water in Pit:		(in.)	Water-Stained Leaves
			Local Soil Survey Data
Depth to Saturated Soil:	>16	(in.)	FAC-Neutral Test
			Other (Explain in Remarks)

Remarks: ABSENCE OF HYDROLOGY AND INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T10P4

SOILS

Map Unit Name
(Series and Phase): Oshtemo-Ormas loamy sands Drainage Class: well drained

Taxonomy (Subgroup): Typic Hapludalfs Field Observations Confirm Mapped Type? (circle) Yes **No**

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0-4	1	10YR 2/2		SANDY LOAM
4-12"	2	10YR 4/6		SANDY GRAVELLY LOAM

Hydric Soil Indicators:

Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: SOIL CRITERION NOT MET AT DATA STATION BY SOIL COLOR.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	**No**
Wetland Hydrology Present?	Yes	**No**
Hydric Soils Present?	Yes	**No**

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	**No**

Remarks:
NON-WETLAND BASED ON ABSENCE OF VEGETATION , HYDROLOGY, AND SOILS INDICATORS.
UPLAND WOODS

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Lake Gage/Lime Lake LARE Stud	Date:	05/20/05
Applicant/Owner:	Lake Gage & Lime Lake Assoc. In	County:	Steuben
Investigator:	Nathan Simons	State:	Indiana
		Location:	Sec .1, T.37 N., R.12 E.

Do Normal Circumstances exist on the site?	Yes	No	Community ID:	Creek
Is the site significantly disturbed (Atypical Situation	Yes	No		
Is the area a potential Problem Area?	Yes	No	Transect ID:	T10
(If needed, explain on reverse.)			Plot ID:	P5

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	N/A			9.			
2.				10.			
3.				11.			
4.				12.			
5.				13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FA 0%

Remarks: NON-VEGETATED STREAM CHANNEL.CRITERION MET BY DOMINANCE OF HYDROPHYTIC VEGETATION

HYDROLOGY

Wetland Hydrology Indicators

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Primary Indicators
- X Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water:	8 INCHES	(in.)
Depth to Free Water in Pit:		(in.)
Depth to Saturated Soil:		(in.)

Secondary Indicators (2 or more required)
- Oxidized Root Channels in Upper 12 inches
- Water-Stained Leaves
- Local Soil Survey Data
- FAC-Neutral Test
- Other (Explain in Remarks)

Remarks: CRITERIAN MET BY PRESENCE OF HYDROLOGY AND PRIMARY INDICATORS.

DATA FORM - CONTINUED
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Lake Gage/Lime Lake LARE study Plot ID: T10P5

SOILS

Map Unit Name
(Series and Phase): Riverdale loamy sand Drainage Class: somewhat poorly drained

Taxonomy (Subgroup): Typic Medisaprists Field Observations Confirm Mapped Type? (circle) Yes **No**

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Structure, Concretions, etc.
0	1	N/A		SAND and GRAVEL

Hydric Soil Indicators:

Histosol	Concretions
Histic Epipedon	High Organic Content in Surface Layer in Sandy Soils
Sulfidic Odor	Organic Streaking in Sandy Soils
Aquic Moisture Regime	Listed on Local Hydric Soils List
Reducing Conditions	Listed on National Hydric Soils List
Gleyed or Low-Chroma Colors	Other (Explain in Remarks)

Remarks: NON-SOIL.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	**No**
Wetland Hydrology Present?	**Yes**	**No**
Hydric Soils Present?	Yes	**No**

	(Circle)	
Is this Sampling Point Within a Wetland?	Yes	**No**

Remarks:
DATA POINT IS IN CREEK. THE CREEK IS A 'WATER OF THE U.S.'
THIS IS A DREDGED CHANNEL THROUGH UPLAND SOILS.

APPENDIX D

SUBMERSED AQUATIC DATA

Landmark	Coord N Degrees	minutes	Coord W Degrees	minutes	0,0 at 300N & 900W X on CAD map	Y on CAD map
250.000	41.000	41.980	85.000	6.310	15639.275	5580.855
251.000	41.000	41.980	85.000	6.300	15686.212	5580.855
252.000	41.000	42.010	85.000	6.290	15733.148	5778.524
253.000	41.000	41.990	85.000	6.290	15733.148	5646.744
254.000	41.000	41.980	85.000	6.270	15827.022	5580.855
255.000	41.000	41.990	85.000	6.250	15920.895	5646.744
256.000	41.000	41.980	85.000	6.250	15920.895	5580.855
257.000	41.000	41.970	85.000	6.260	15873.958	5514.965
258.000	41.000	41.950	85.000	6.270	15827.022	5383.186
259.000	41.000	41.970	85.000	6.280	15780.085	5514.965
260.000	41.000	41.930	85.000	6.310	15639.275	5251.406
261.000	41.000	41.960	85.000	6.330	15545.402	5449.075
262.000	41.000	41.980	85.000	6.310	15639.275	5580.855
263.000	41.000	42.000	85.000	6.320	15592.339	5712.634
264.000	41.000	41.980	85.000	6.280	15780.085	5580.855
265.000	41.000	42.020	85.000	6.280	15780.085	5844.413
266.000	41.000	42.040	85.000	6.270	15827.022	5976.193
267.000	41.000	42.050	85.000	6.300	15686.212	6042.082
268.000	41.000	42.030	85.000	6.350	15451.529	5910.303
269.000	41.000	41.910	85.000	6.270	15827.022	5119.627
270.000	41.000	41.910	85.000	6.260	15873.958	5119.627
271.000	41.000	41.940	85.000	6.270	15827.022	5317.296
272.000	41.000	41.910	85.000	6.300	15686.212	5119.627

APPENDIX A

Delta Plant Bed

Submersed Aquatic Plant Survey Form

WATER BODY NAME Gage
COUNTY Steuben
DATE 7-14-2005
CREW LEADER SB
RECORDER JC
Delta Plant Bed
Plant Bed Growth - 14'

SECCHI 10' 10" Lime Lake 5' 11"
MAX PLANT DEPTH
WEATHER Cloudy (Rain 83° NE Winds 5mph
COMMENTS No Plants near Surface

Rake score (1-5), observed only (9), algae present (p)
Use acronyms for species, V1, V2...for voucher codes

Site	Northing	~~Easting~~ POOL	Depth	All	CH	POPU	MYSP	NAFL	POCR	ELCA	CEDE	STPE	Algae	MYHE	Note
~~250~~			~~1'~~				9								
250			9½'				5	1	1						
251			5½'			1	5	1	2						
252			6.3'			1	3	1							
253			7'				1	2	1	1					
254			5½'		1		5	2			1	1			
255			3'				1	1		1			P		
256			2'				1								
257			3'				3								
258			5'				1								
259			6½'				1		1	2	5	1			
260			11'				5	1							
261			14'				1	1							
262			10½'				1	1	1						
263			9'		1	1	1	9				1			
264			6'					1	2		5				
265			7'				5	9 1							
266			7'				5	1							
267			7½'										P		
268			16'												
269			7'			1	1	1						1	
270		1	5½'		1		1								
271			7'		1	3	1	1	1	1					
272			11'				2	1				1			
~~273~~															

Other plant species observed at lake: ILPO

Plant Bed to 14'
CH POPU MYSP NAFL

APPENDIX E

BENTHIC MACROINVERTEBRATES

SAMPLING AND ANALYSIS DATA

Sample #2 - Concorde Creek (Orland Rd.)

Site Description and Location

The site was located just off Orland Rd. The site had good habitat and an intact floodplain and buffer area. There was a beaver pond about 300' upstream of the site. There were multiple riffles within the reach made up of gravel to small cobble material. Indications were that the stream does go dry in the summer at times. Overall, good habitat for macroinvertabrates.

Sampling Methods – Riffle Kick

Three replicate kick samples were completed at the site (see field notes for exact locations). A 500 micron kick net was placed downstream and a 1 m^2 area was disturbed upstream. Bugs were collected in the net and preserved in a solution of 80% alcohol for laboratory analysis.

Results

Detailed taxonomy and counts are shown at the right. The scores for the site, including scores for individual metrics are shown below.

Metric	*Score*
Family Level HBI	4
Number of Taxa	6
Number of Individuals	4
% Dominant Taxa	4
EPT Index	4
EPT Count	2
EPT Count / Total Individuals	2
EPT Count / Chironomid Count	2
Number of Chironomids	4
Total Count / Count of Sub-sample Squares	4
m-IBI Score	**3.6**
QHEI Score	**69.5**

(for QHEI Metric Scores see data sheet)

Concorde Creek	Orland Rd 8/8/2005
Taxon (Family or other)	
Turbellaria	
Tricladida	1
Mollusca	
Bivalvia	
Corbiculidae	1
Sphaeriidae	5
Gastropoda	
Physidae	1
Crustacea	
Amphipoda	
Gammaridae	9
Hyalellidae	2
Isopoda	
Asellidae	5
Hexapoda	
Ephemeroptera	
Baetidae	11
Caenidae	1
Heptageniidae	1
Trichoptera	
Hydropsychidae	25
Philopotamidae	2
Coleoptera	
Elmidae	54
Diptera	
Chironomidae	26
Simuliidae	8
Tabanidae	1
TOTAL	153

Field Data

- QHEI Data Sheet
- Photos
- Field Notes
- Macroinvertabrate Bench Sheet

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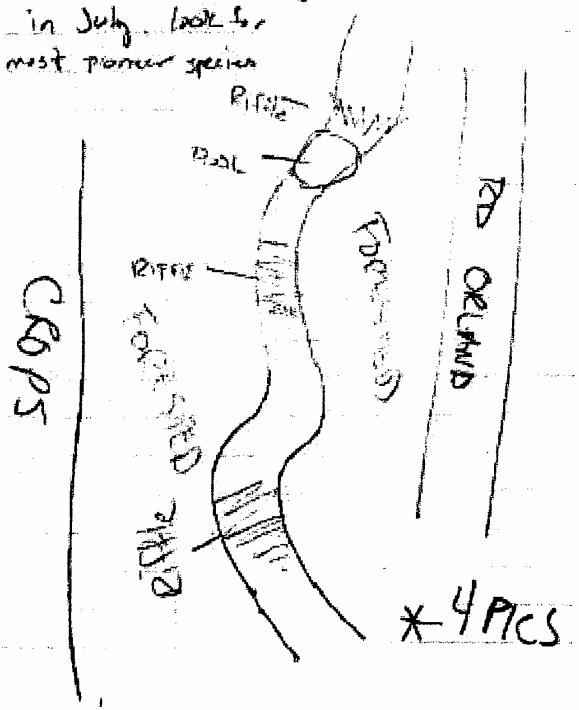
#2 CONCORDE CREEK 5/8/05

- Lake George TRIB.
- 3 KICKS 1 METER^2 @ each Riffle
- Good site, poor bugs, intermittent in July. Look for most pioneer species



Approx LAT 41° 42 04.9 N
LONG 85° 04.950' W

Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 69.5

River Code: **RM:** **Stream:** CONOVER CREEK (SAMPLE #2)
Date: 8/8/05 **Location:** RIFFLE ADJACENT ORLAND RD.
Scorers Full Name: SCOTT BANFIELD **Affiliation:**

1] SUBSTRATE (Check ONLY Two SubstrateTYPE BOXES; Estimate % present

TYPE	POOL	RIFFLE
☐ -BLDR /SLBS[10]	____	____
☐ -BOULDER [9]	____	____
☒ -COBBLE [8]	____	5
☐ -HARDPAN [4]	____	____
☐ -MUCK [2]	____	____
☒ -SILT [2]	60	____

	POOL	RIFFLE
☐ -GRAVEL [7]	45	50
☐ -SAND [6]	40	
☐ -BEDROCK[5]	____	____
☐ -DETRITUS[3]	____	____
☐ -ARTIFICIAL[0]	____	____

NOTE: Ignore Sludge Originating From Point Sources

SUBSTRATE ORIGIN Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1] SILT:
☑ -TILLS [1]
☑ -WETLANDS[0]
☐ -HARDPAN [0]
☐ -SANDSTONE [0] EMBEDDED
☐ -RIP/RAP [0] NESS:
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY Check ONE (OR 2 & AVERAGE)
☐ - SILT HEAVY [-2]
☐ -SILT MODERATE [-1]
☑ -SILT NORMAL [0]
☐ -SILT FREE [1]
☐ -EXTENSIVE [-2]
☐ -MODERATE [-1]
☑ -NORMAL [0]
☐ -NONE [1]

Substrate 12 Max 20

NUMBER OF SUBSTRATE TYPES: (High Quality Only, Score 5 or >) ☑ -4 or More [2] ☐ -3 or Less [0]

COMMENTS:

2] INSTREAM COVER (Give each cover type a score of 0 to 3, see back for instructions)

(Structure)	TYPE: Score All That Occur		
0 UNDERCUT BANKS [1]	____ POOLS> 70 cm [2]	____ OXBOWS, BACKWATERS [1]	
1 OVERHANGING VEGETATION [1]	____ ROOTWADS [1]	1 AQUATIC MACROPHYTES [1]	
3 SHALLOWS (IN SLOW WATER) [1]	1 BOULDERS [1]	1 LOGS OR WOODY DEBRIS [1]	
2 ROOTMATS [1]	COMMENTS:		

AMOUNT (Check ONLY One or check 2 and AVERAGE)
☐ - EXTENSIVE > 75% [11]
☑ - MODERATE 25-75% [7]
☐ - SPARSE 5-25% [3]
☐ - NEARLY ABSENT < 5%[1]

Cover 14 Max 20

3] CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	MODIFICATIONS/OTHER	
☐ - HIGH [4]	☑ - EXCELLENT [7]	☑ - NONE [6]	☑ - HIGH [3]	☐ - SNAGGING	☐ - IMPOUND.
☑ - MODERATE [3]	☐ - GOOD [5]	☐ - RECOVERED [4]	☐ - MODERATE [2]	☐ - RELOCATION	☐ - ISLANDS
☐ - LOW [2]	☐ - FAIR [3]	☐ - RECOVERING [3]	☐ - LOW [1]	☐ - CANOPY REMOVAL	☐ - LEVEED
☐ - NONE [1]	☐ - POOR [1]	☐ - RECENT OR NO RECOVERY [1]		☐ - DREDGING	☐ - BANK SHAPING
				☐ - ONE SIDE CHANNEL MODIFICATIONS	

Channel 19 Max 20

COMMENTS:

4] RIPARIAN ZONE AND BANK EROSION(check ONE box per bank or check 2 and AVERAGE per bank) * River Right Looking Downstream *

RIPARIAN WIDTH L R (Per Bank)	L R (Most Predominant Per Bank)	FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN) L R	BANK EROSION L R (Per Bank)
☐ ☐ - WIDE > 50m [4]	☑ ☐ -FOREST, SWAMP [3]	☐ ☐ -CONSERVATION TILLAGE [1]	☑ ☑ -NONE/LITTLE [3]
☑ ☐ - MODERATE 10-50m [3]	☐ ☐ -SHRUB OR OLD FIELD [2]	☐ ☐ -URBAN OR INDUSTRIAL [0]	☐ ☐ -MODERATE [2]
☐ ☐ - NARROW 5-10 m [2]	☐ ☐ -RESIDENTIAL,PARK,NEW FIELD [1]	☑ ☑ -OPEN PASTURE,ROWCROP [0]	☐ ☐ -HEAVY/SEVERE[1]
☐ ☑ - VERY NARROW <5 m[1]	☐ ☐ -FENCED PASTURE [1]	☐ ☐ -MINING/CONSTRUCTION [0]	
☐ ☐ - NONE [0]			

Riparian 6.5 Max 10

COMMENTS:

6] POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)	MORPHOLOGY (Check 1 or 2 & AVERAGE)	CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)	
☐ - >1m [6]	☑ -POOL WIDTH > RIFFLE WIDTH [2]	☐ -EDDIES[1]	☐ -TORRENTIAL[-1]
☐ - 0.7-1m [4]	☐ -POOL WIDTH = RIFFLE WIDTH [1]	☑ -FAST[1]	☐ -INTERSTITIAL[-1]
☑ - 0.4-0.7m [2]	☐ -POOL WIDTH < RIFFLE W. [0]	☑ -MODERATE [1]	☐ -INTERMITTENT[-2]
☐ - 0.2- 0.4m [1]		☑ -SLOW [1]	☐ -VERY FAST[1]
☐ - < 0.2m [POOL=0]	COMMENTS:		

Pool/Current 7 Max 12

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH	RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS
☐ - Best Areas >10 cm [2]	☐ - MAX > 50 [2]	☐ -STABLE (e.g.,Cobble, Boulder) [2]	☐ - NONE [2]
☑ - Best Areas 5-10 cm[1]	☑ - MAX < 50[1]	☑ -MOD. STABLE (e.g.,Large Gravel) [1]	☐ - LOW [1]
☐ - Best Areas < 5 cm [RIFFLE=0]		☐ -UNSTABLE (Fine Gravel,Sand) [0]	☑ - MODERATE [0]
			☐ - EXTENSIVE [-1]

COMMENTS: ☐ - NO RIFFLE [Metric=0]

Riffle/Run 3 Max 8

Gradient 8 Max 10

6] GRADIENT (ft/mi) 21 DRAINAGE AREA (sq mi) approx. 14 mi²

%POOL: 20 %GLIDE:
%RIFFLE: 70 %RUN: 10

* Best areas must be large enough to support a population of macroinvertebrates

EPA 4520 06/24/01

id - MZS

Is Sampling Reach Representative of the Stream (Y/N) N If Not, Explain: RESEMBLES 50%
HABITAT CROOKED TO LK GAGE

Major Suspected Sources of Impacts (Check All That Apply)
None ☐
Industrial ☐
WWTP ☐
Ag ☐
Livestock ☐
Silviculture ☐
Construction ☐
Urban Runoff ☐
CSOs ☐
Suburban Impacts ☐
Mining ☐
Channelization ☐
Riparian Removal ☐
Landfills ☐
Natural ☐
Dams ☐
Other Flow Alteration ☐
Other: _____

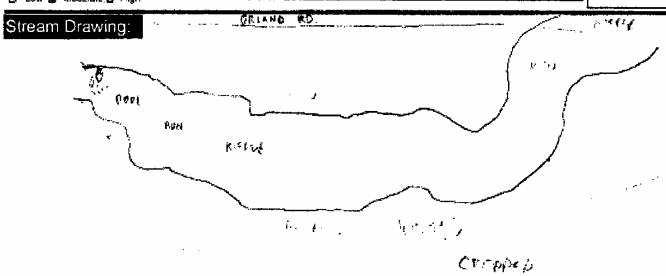
	Gear	Distance	Water Clarity	Water Stage	Canopy - % Open
First Sampling Pass	KICK NET	100FT	GOOD	LOW/NORM	80%

Subjective Rating (1-10): 9
Aes/Hetic Rating (1-10): 9
Gradient: ☐ - Low ☒ - Moderate ☐ - High

Stream Measurements

Average Width	Average Depth	Maximum Depth	Av Bankfull Width	Bankfull Mean Depth	W/D Ratio	Bankfull Max Depth	Floodprone Area Width	Entrench Ratio
20ft.	6"	1.5ft.						

Stream Drawing:



Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3. Where: 0 - Cover type absent; 1 - Cover type present in very small amounts or if more common of marginal quality; 2 - Cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 - Cover type of highest quality in moderate or greater amounts. Examples of highest quality include very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep/fast water, or deep, well-defined, functional pools

Yes/No	
☐☐	Is Stream Ephemeral and pools totally dry or only damp spots?
☐☐	Is there water upstream? How Far: _____
☐☐	Is There Water Come Downstream? How Far: _____
☐☐	Is Dry Channel Mostly Natural?

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OWM - BIOLOGICAL STUDIES
BENTHIC MACROINVERTEBRATE BENCH SHEET
PHASE 1 TAXONOMY

SAMPLE NUMBER _____ SITE _____ COUNTY _____ CREW CHIEF _____
LOCATION _____ HYDROLOGIC UNIT _____ DATE OF COLLECTION _____
ECOREGION _____ ASNRI _____ SORTER _____ LABEL CHECK _____

EPHEMEROPTERA
SIPHLONURIDAE (7) _____ METRETOPODIDAE (2) _____ BAETIDAE (4) _____ BAETISCIDAE (5) _____ HEPTAGENIIDAE (4) _____
EPHEMERELLIDAE (1) _____ TRICORYTHIDAE (4) _____ CAENIDAE (7) _____ OLIGONEURIIDAE (2) _____ LEPTOPHLEBIIDAE (2) _____
POTAMANTHIDAE (4) EPHEMERIDAE (4) _____ POLYMITARCYIDAE (2) _____

ODONATA ZYGOPTERA
CORDULEGASTRIDAE (3) _____ GOMPHIDAE (1) _____ AESHNIDAE (3) _____ MACROMIIDAE (3) CORDULIIDAE (3) _____
LIBELLULIDAE (9) CALOPTERYGIDAE (5) LESTIDAE (9) _____ COENAGRIONIDAE (9) _____

PLECOPTERA
PTERONARCYIDAE (0) _____ TAENIOPTERYGIDAE (2) NEMOURIDAE (2) _____ LEUCTRIDAE (0) _____ CAPNIIDAE (1) _____
PERLIDAE (1) PERLODIDAE (2) CHLOROPERLIDAE (1) _____

HEMIPTERA
MACROVELIIDAE ( ) _____ VELIIDAE ( ) _____ GERRIDAE ( ) _____ BELOSTOMATIDAE ( ) _____ NEPIDAE ( ) _____ CORIXIDAE ( ) _____
NOTONECTIDAE ( ) _____ PLEIDAE ( ) _____ SALDIDAE ( ) _____ HEBRIDAE ( ) _____ NAUCORIDAE ( ) _____ MESOVELIIDAE ( ) _____

MEGALOPTERA SIALIDAE (4) _____ CORYDALIDAE ( ) _____ SISYRIDAE ( ) _____

TRICHOPTERA
PHILOPOTAMIDAE (3) _____ PSYCHOMYIIDAE (2) _____ POLYCENTROPODIDAE (6) _____ HYDROPSYCHIDAE (4) _____
RHYACOPHILIDAE (0) _____ GLOSSOSOMATIDAE (0) _____ HYDROPTILIDAE (4) PHRYGANEIDAE (4) _____
BRACHYCENTRIDAE (1) _____ LEPIDOSTOMATIDAE (1) _____ HELICOPSYCHIDAE (3) _____ SERICOSTOMATIDAE (3) _____
ODONTOCERIDAE (3) _____ MOLANNIDAE (6) _____ LIMNEPHILIDAE (4) _____ LEPTOCERIDAE (4) _____

LEPIDOPTERA PYRALIDAE (5) _____ NOCTUIDAE ( ) _____

COLEOPTERA
GYRINIDAE ( ) _____ HALIPLIDAE ( ) _____ DYTISCIDAE ( ) _____ HYDROPHILIDAE ( ) _____ PSEPHENIDAE (4) _____ DRYOPIDAE(5) _____ ELMIDAE(4)
SCIRTIDAE ( ) _____ STAPHYLINIDAE ( ) _____ CHRYSOMELIDAE ( ) _____ CURCULIONIDAE ( ) _____ DYTISCIDAE ( )

DIPTERA
BLEPHARICERIDAE (0) _____ TIPULIDAE (3) _____ PSYCHODIDAE (10) _____ TABANIDAE (6) _____ ATHERICIDAE (2) _____
CHIRONOMIDAE(blood red)(6) _____ CHIRONOMIDAE(all other)(6) _____ SYRPHIDAE (10) _____ EPHYDRIDAE (6) _____ MUSCIDAE (6)
DOLICHOPODIDAE (4) _____ EMPIDIDAE (6) _____ CERATOPOGONIDAE (6) _____ SIMULIIDAE (0) _____ CHAOBORIDAE ( ) _____

COLLEMBOLA ISOTOMIDAE ( ) _____ PODURIDAE ( ) _____ SMINTHURIDAE ( ) _____ ENTOMOBRYIDAE ( ) _____

OTHER ARTHROPODA
ACARI (4) _____ ASELLIDAE (8) _____ GAMMARIDAE (4) _____ TALITRIDAE (8) _____ ASTACIDAE (6) _____

MOLLUSCA
GASTROPODA FERRISSIA (6) _____ HELISOMA (8) _____ LYMNAEA (6) _____ AMNICOLA (8) _____ PLEUROCERIDAE ( ) VIVIPARIDAE ( ) _____
BITHYNIA (8) _____ GYRAULUS (8) _____ PHYSA (8) _____ PLANORBIDAE ( ) HYDROBIIDAE ( ) _____ ANCYLIDAE ( ) _____
PELECYPODA SPHAERIIDAE (8) _____ CORBICULA ( ) _____ DREISSENA ( ) _____

PLATYHELMINTHES TURBELLARIA (4) _____ ANNELIDA ( ) _____ OLIGOCHAETA ( ) _____ TUBIFICIDAE ( ) _____ NAIDIDAE ( ) _____
HIRUDINEA ( ) _____ HELOBDELLA (10) _____ BRANCHIOBDELLIDA ( ) _____ ERPOBDELLIDAE ( ) _____ NEMATODA ( ) _____

NUMBER OF VIALS FORWARDED _____ PRELIMINARY NUMBER OF TAXA _____ NUMBER OF INDIVIDUALS _____

HBI _____ EPT COUNT _____ EPT ABUN./CHIR. ABUN. _____ CHIRONOMID COUNT _____

% DOMINANT TAXON _____ EPT INDEX _____ EPT/TOTAL COUNT _____

PHASE 1 IDENTIFICATION COMPLETED BY _____ DATE COMPLETED _____ COUNTS & CALCULATION CHECK _____

Sample #3 - Concorde Creek (Butler's Woods)

Site Description and Location

The sampling location was located about 300' upstream of the mouth of Concorde Creek where it empties into Lake Gage. The site had decent habitat but was greatly incised and exhibited characteristics of a very unstable stream. Overall habitat for macroinvertabrates was mediocre at best.

Sampling Methods – Riffle Kick

Three replicate kick samples were completed at the site (see field notes for exact locations). A 500 micron kick net was placed downstream and a 1 m^2 area was disturbed upstream. Bugs were collected in the net and preserved in a solution of 80% alcohol for laboratory analysis.

Results

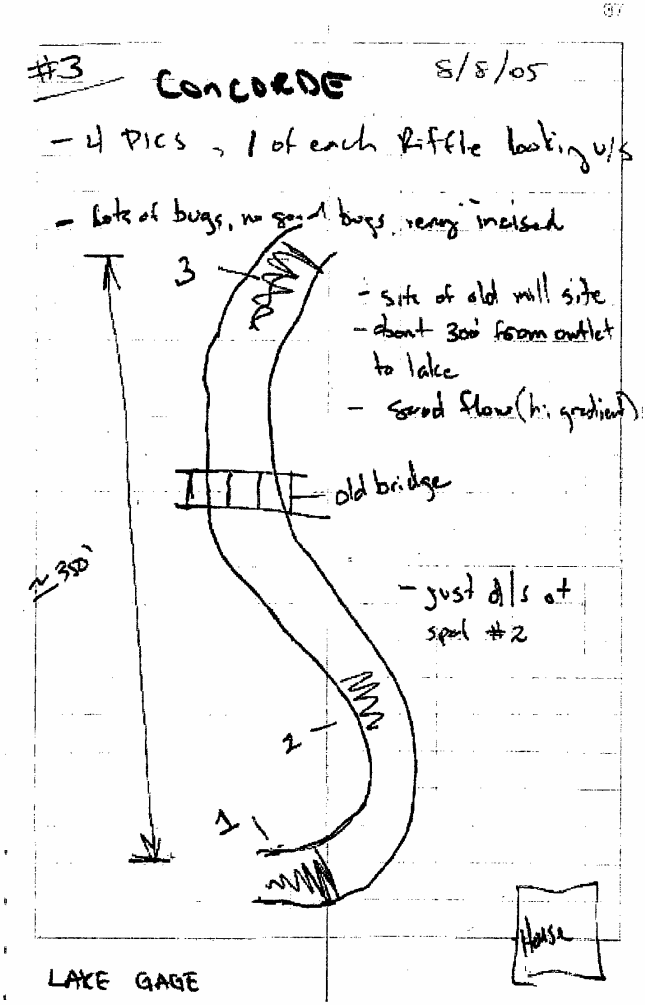
Detailed taxonomy and counts are shown at the right. The scores for the site, including scores for individual metrics are shown below.

Metric	***Score***
Family Level HBI	8
Number of Taxa	4
Number of Individuals	6
% Dominant Taxa	2
EPT Index	4
EPT Count	6
EPT Count / Total Individuals	4
EPT Count / Chironomid Count	8
Number of Chironomids	6
Total Count / Count of Sub-sample Squares	6
m-IBI Score	**5.4**
QHEI Score	
(for QHEI Metric Scores see data sheet)	**58**

Concorde Creek	
Taxon (Family or other)	Butler's Woods 8/8/2005
Turbellaria	
Tricladida	1
Annelida	
Euhirudinea	
Erpobdellidae	2
Mollusca	
Bivalvia	
Dreissenidae	
Sphaeriidae	1
Crustacea	
Amphipoda	
Gammaridae	6
Decapoda	
Cambaridae	1
Hexapoda	
Ephemeroptera	
Heptageniidae	12
Trichoptera	
Helicopsychidae	8
Hydropsychidae	76
Philopotamidae	1
Coleoptera	
Elmidae	115
Diptera	
Chironomidae	7
Simuliidae	1
Tabanidae	3
Tipulidae	1
TOTAL	236

Field Data

- QHEI Data Sheet
- Photos
- Field Notes
- Macroinvertabrate Bench Sheet


#3 Concorde 8/8/05
- 4 pics, 1 of each Riffle looking u/s
- lots of bugs, no good bugs, very incised
3
- site of old mill site
- about 300' from outlet to lake
- good flow (hi gradient)
old bridge
~350'
- just d/s of spot #2
2
1
LAKE GAGE
House

APPROX. LAT: 41° 49'24" N
LON: 85° 00'56" W

Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 58

River Code: **RM:** **Stream:** CONCORDE CREEK (SAMPLE #3)
Date: 8/8/05 **Location:** MILE POST 1.7 U/S LAKE GAGE CONFLUENCE
Scorers Full Name: MATT BANNING **Affiliation:**

1] SUBSTRATE (Check ONLY Two SubstrateTYPE BOXES; Estimate % present

TYPE	POOL	RIFFLE
☐ ☐-BLDR /SLBS[10]		
☐ ☐-BOULDER [9]		
☐ ☐-COBBLE [8]		
☐ ☐-HARDPAN [4]		
☐ ☐-MUCK [2]		
☐ ☐-SILT [2]		

	POOL	RIFFLE
☑ ☑-GRAVEL [7]	25	
☑ ☑-SAND [6]		
☐ ☐-BEDROCK[5]		
☐ ☐-DETRITUS[3]		
☐ ☐-ARTIFICIAL[0]		

NOTE: Ignore Sludge Originating From Point Sources

SUBSTRATE ORIGIN (Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1] ☐ -SILT
☑ -TILLS [1]
☐ -WETLANDS[0]
☐ -HARDPAN [0]
☐ -SANDSTONE [0] EMBEDDED
☐ -RIP/RAP [0] NESS:
☐ -SHALE [-1]
☐ -COAL FINES [-2]

SUBSTRATE QUALITY (Check ONE (OR 2 & AVERAGE)
☐ -SILT HEAVY [-2]
☐ -SILT MODERATE [-1]
☑ -SILT NORMAL [0]
☐ -SILT FREE [1]
☐ -EXTENSIVE [-2]
☐ -MODERATE [-1]
☑ -NORMAL [0]
☐ -NONE [1]

Substrate 14 Max 20

NUMBER OF SUBSTRATE TYPES: ☐-4 or More [2] (High Quality Only, Score 3 or >) ☑-3 or Less [0]

COMMENTS:

2] INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure)	TYPE: Score All That Occur		AMOUNT (Check ONLY One or check 2 and AVERAGE)
___UNDERCUT BANKS [1]	___POOLS> 70 cm [2]	___OXBOWS, BACKWATERS [1]	☐ - EXTENSIVE > 75% [11]
0 OVERHANGING VEGETATION [1]	1 ROOTWADS [1]	___AQUATIC MACROPHYTES [1]	☑ - MODERATE 25-75% [7]
2 SHALLOWS (IN SLOW WATER) [1]	___BOULDERS [1]	3 LOGS OR WOODY DEBRIS [1]	☐ - SPARSE 5-25% [3]
___ROOTMATS [1]	COMMENTS:		☐ - NEARLY ABSENT < 5%[1]

Cover 11 Max 20

3] CHANNEL MORPHOLOGY (Check ONLY One PER Category OR check 2 and AVERAGE)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	MODIFICATIONS/OTHER	
☐ - HIGH [4]	☐ - EXCELLENT [7]	☐ - NONE [6]	☐ - HIGH [3]	☐ - SNAGGING	☐ - IMPOUND.
☑ MODERATE [3]	☐ - GOOD [5]	☐ - RECOVERED [4]	☐ - MODERATE [2]	☑ - RELOCATION	☐ - ISLANDS
☐ - LOW [2]	☑ - FAIR [3]	☑ - RECOVERING [3]	☑ - LOW [1]	☐ - CANOPY REMOVAL	☐ LEVEED
☐ - NONE [1]	☐ - POOR [1]	☐ - RECENT OR NO RECOVERY [1]		☐ - DREDGING	☐ BANK SHAPING
				☐ - ONE SIDE CHANNEL MODIFICATIONS	

Channel 10 Max 20

COMMENTS:

4]. RIPARIAN ZONE AND BANK EROSION(check ONE box per bank or check 2 and AVERAGE per bank) * River Right Looking Downstream *

RIPARIAN WIDTH L R (Per Bank)	FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN) L R (Most Predominant Per Bank)	BANK EROSION L R (Per Bank)
☑ ☑ WIDE > 50m [4]	☑ ☑ FOREST, SWAMP [3]	☐ ☐ CONSERVATION TILLAGE [1]	☐ ☐ -NONE/LITTLE [3]
☐ ☐ - MODERATE 10-50m [3]	☐ ☐ SHRUB OR OLD FIELD [2]	☐ ☐ -URBAN OR INDUSTRIAL [0]	☐ ☐ -MODERATE [2]
☐ ☐ - NARROW 5-10 m [2]	☐ ☐ RESIDENTIAL,PARK,NEW FIELD [1]	☐ ☐ -OPEN PASTURE,ROWCROP [0]	☑ ☑ -HEAVY/SEVERE[1]
☐ ☐ - VERY NARROW <5 m[1]	☐ ☐ -FENCED PASTURE [1]	☐ ☐ -MINING/CONSTRUCTION [0]	
☐ ☐ - NONE [0]			

Riparian 8 Max 10

COMMENTS:

5]POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)	MORPHOLOGY (Check 1 or 2 & AVERAGE)	CURRENT VELOCITY (POOLS & RIFFLES*) (Check All That Apply)	
☐ - >1m [6]	☐ -POOL WIDTH > RIFFLE WIDTH [2]	☐ -EDDIES[1]	☐ -TORRENTIAL[-1]
☐ - 0.7-1m [4]	☐ -POOL WIDTH = RIFFLE WIDTH [1]	☑ -FAST[1]	☐ -INTERSTITIAL[-1]
☐ - 0.4-0.7m [2]	☑ -POOL WIDTH < RIFFLE W. [0]	☑ -MODERATE [1]	☐ -INTERMITTENT[-2]
☑ - 0.2- 0.4m [1]		☐ -SLOW [1]	☐ -VERY FAST[1]
☐ - < 0.2m [POOL=0]	COMMENTS:		

Pool/ Current 3 Max 12

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH	RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS
☐ - Best Areas >10 cm [2]	☐ - MAX > 50 [2]	☐ -STABLE (e.g.,Cobble, Boulder) [2]	☐ - NONE [2]
☑ - Best Areas 5-10 cm[1]	☑ - MAX < 50[1]	☑ -MOD. STABLE (e.g.,Large Gravel) [1]	☑ - LOW [1]
☐ - Best Areas < 5 cm [RIFFLE=0]		☐ -UNSTABLE (Fine Gravel,Sand) [0]	☐ - MODERATE [0]
			☐ - EXTENSIVE [-1]

Riffle/Run 4 Max 8

COMMENTS:

☐ - NO RIFFLE [Metric=0]

Gradient 8 Max 10

6] GRADIENT (ft/mi): 21 DRAINAGE AREA (sq.mi.): ≈ 14.7 mi² %POOL: 5 %GLIDE: %RIFFLE: 60 %RUN: 35

* Best areas must be large enough to support a population of riffle-obligate species

EPA 4520 06/24/01

Is Sampling Reach Representative of the Stream (Y/N)___ If Not, Explain:

Major Suspected Sources of Impacts (Check All That Apply):
None ☐
Industrial ☐
WWTP ☐
Ag ☐
Livestock ☐
Silviculture ☐
Construction ☐
Urban Runoff ☐
CSOs ☐
Suburban Impacts ☐
Mining ☐
Channelization ☐
Riparian Removal ☐
Landfills ☐
Natural ☐
Dams ☐
Other Flow Alteration ☐
Other _____

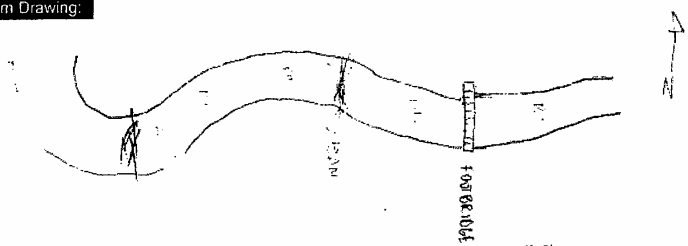
Subjective Rating (1-10)	Aesthetic Rating (1-10)	Gear	Distance	Water Clarity	Water Stage	Canopy % Open
6	8	First Sampling Pass: KICKNET		Roots	Low	5

Gradient ☐ - Low, ☐ - Moderate, ☐ - High

Stream Measurements

Average Width	Average Depth	Maximum Depth	Av Bankfull Width	Bankfull Mean Depth	W/D Ratio	Bankfull Max Depth	Floodprone Area Width	Entrench Ratio
12	6"	1'						

Stream Drawing:



Instructions for scoring the alternate cover metric. Each cover type should receive a score of between 0 and 3. Where: 0 - Cover type absent. 1 - Cover type present in very small amounts or if more common of marginal quality. 2 - Cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality. 3 - Cover type of highest quality in moderate or greater amounts. Examples of highest quality include very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep/fast water, or deep, well-defined, functional pools.

Yes/No

☐☐ Is Stream Ephemeral (no pools, totally dry or only damp spots)?

☐☐ Is there water upstream? How Far _____

☐☐ Is There Water Close Downstream? How Far _____

☐☐ Is Dry Channel Mostly Natural?

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OWM - BIOLOGICAL STUDIES
BENTHIC MACROINVERTEBRATE BENCH SHEET
PHASE 1 TAXONOMY

SAMPLE NUMBER _____ SITE _____ COUNTY _____ CREW CHIEF _____
LOCATION _____ HYDROLOGIC UNIT _____ DATE OF COLLECTION _____
ECOREGION _____ IASNI# _____ SORTER _____ LABEL CHECK _____

EPHEMEROPTERA
SIPHLONURIDAE (7) _____ METRETOPODIDAE (7) _____ BAETIDAE (4) _____ BAETISCIDAE (3) _____ HEPTAGENIIDAE (4) _____
EPHEMERELLIDAE (1) _____ TRICORYTHIDAE (4) _____ CAENIDAE (7) _____ OLIGONEURIIDAE (2) _____ LEPTOPHLEBIIDAE (2) _____
POTAMANTHIDAE (4) _____ EPHEMERIDAE (4) _____ POLYMITARCYIDAE (2) _____

ODONATA ZYGOPTERA
CORDULEGASTRIDAE (3) _____ GOMPHIDAE (1) _____ AESHNIDAE (3) _____ MACROMIDAE (3) _____ CORDULIIDAE (3) _____
LIBELLULIDAE (9) _____ CALOPTERYGIDAE (5) _____ LESTIDAE (0) _____ COENAGRIONIDAE (0) _____

PLECOPTERA
PTERONARCYIDAE (0) _____ TAENIOPTERYGIDAE (2) _____ NEMOURIDAE (2) _____ LEUCTRIDAE (0) _____ CAPNIIDAE (1) _____
PERLIDAE (1) _____ PERLODIDAE (2) _____ CHLOROPERLIDAE (1) _____

HEMIPTERA
MACROVELIIDAE ( ) _____ VELIIDAE ( ) _____ GERRIDAE ( ) _____ BELOSTOMATIDAE ( ) _____ NEPIDAE ( ) _____ CORIXIDAE ( ) _____
NOTONECTIDAE ( ) _____ PLEIDAE ( ) _____ SALDIDAE ( ) _____ VELIIDAE ( ) _____ NAUCORIDAE ( ) _____ MESOVELIIDAE ( ) _____

MEGALOPTERA SIALIDAE (4) _____ CORYDALIDAE ( ) _____ SISYRIDAE ( ) _____

TRICHOPTERA
PHILOPOTAMIDAE (3) _____ PSYCHOMYIIDAE (2) _____ POLYCENTROPODIDAE (6) _____ HYDROPSYCHIDAE (4) _____
RHYACOPHILIDAE (0) _____ GLOSSOSOMATIDAE (0) _____ HYDROPTILIDAE (4) _____ PHRYGANEIDAE (4) _____
BRACHYCENTRIDAE (1) _____ LEPIDOSTOMATIDAE ( ) _____ HELICOPSYCHIDAE (3) _____ SERICOSTOMATIDAE (3) _____
ODONTOCERIDAE (3) _____ MOLANNIDAE (6) _____ LIMNEPHILIDAE (4) _____ LEPTOCERIDAE (4) _____

LEPIDOPTERA PYRALIDAE (5) _____ NOCTUIDAE ( ) _____

COLEOPTERA
GYRINIDAE ( ) _____ HALIPLIDAE ( ) _____ DYTISCIDAE ( ) _____ HYDROPHILIDAE ( ) _____ PSEPHENIDAE (4) _____ DRYOPIDAE(5) _____ ELMIDAE(4) _____
SCIRTIDAE ( ) _____ STAPHYLINIDAE ( ) _____ CURCULIONIDAE ( ) _____ HYDRAENIDAE ( ) _____

DIPTERA
BLEPHARICERIDAE (0) _____ TIPULIDAE (3) _____ PSYCHODIDAE (10) _____ TABANIDAE (6) _____ ATHERICIDAE (2) _____
CHIRONOMIDAE(blood red)(8) _____ CHIRONOMIDAE(all other)(3) _____ SYRPHIDAE (10) _____ EPHYDRIDAE (6) _____ MUSCIDAE (6) _____
BOLICHOPODIDAE (4) _____ EMPIDIDAE (6) _____ CERATOPOGONIDAE (6) _____ SIMULIIDAE (6) _____ CHAOBORIDAE ( ) _____

COLLEMBOLA ISOTOMIDAE ( ) _____ PODURIDAE ( ) _____ SMINTHURIDAE ( ) _____ ENTOMOBRYIDAE ( ) _____

OTHER ARTHROPODA
ACARI (4) _____ ASELLIDAE (8) _____ GAMMARIDAE (4) _____ TALITRIDAE (6) _____ ASTACIDAE (6) _____

MOLLUSCA
GASTROPODA FERRISSIA (6) _____ HELISOMA (6) _____ LYMNAEA (6) _____ AMNICOLA (8) _____ PLEUROCERIDAE ( ) _____ VIVIPARIDAE ( ) _____
BITHYNIA (8) _____ GYRAULUS (8) _____ PHYSA (8) _____ PLANORBIIDAE ( ) _____ HYDROBIIDAE ( ) _____ ANCYLIDAE ( ) _____
PELECYPODA SPHAERIIDAE (8) _____ CORBICULA ( ) _____ DREISSENIA ( ) _____

PLATYHELMINTHES TURBELLARIA (4) _____ ANNELIDA ( ) _____ OLIGOCHAETA ( ) _____ TUBIFICIDAE ( ) _____ NAIDIDAE ( ) _____
HIRUDINEA ( ) _____ HELOBDELLA (10) _____ BRANCHIOBDELLIDA ( ) _____ ERPOBDELLIDAE ( ) _____ NEMATODA ( ) _____

NUMBER OF VIALS FORWARDED _____ PRELIMINARY NUMBER OF TAXA _____ NUMBER OF INDIVIDUALS _____

HBI _____ EPT COUNT _____ EPT ABUN./CHIR. ABUN. _____ CHIRONOMID COUNT _____

% DOMINANT TAXON _____ EPT INDEX _____ EPT/TOTAL COUNT _____

PHASE I IDENTIFICATION COMPLETED BY _____ DATE COMPLETED _____ COUNTS & CALCULATION CHECK _____

Sample #7 - Concorde Creek (Reference Reach)

Site Description and Location

The site is located along Orland Rd. The site was chosen as a potential reference site because it was higher in the watershed and possibly included a less impacted drainage area. Habitat complexity in the reach was good, though a preponderance of fine material (sands) was present. Substrate ranged from sands up to small cobbles. Riffle habitat was present, though pool habitat seemed to be lacking. Habitat complexity was high with overhanging vegetation, riffle/pool sequences, and plenty of large woody debris. Overall habitat was good for macroinvertabrates.

Sampling Methods – Riffle Kick

Three replicate kick samples were completed at the site (see field notes for exact locations). A 500 micron kick net was placed downstream and a 1 m^2 area was disturbed upstream. Bugs were collected in the net and preserved in a solution of 80% alcohol for laboratory analysis.

Results

Detailed taxonomy and counts are shown at the right. The scores for the site, including scores for individual metrics are shown below.

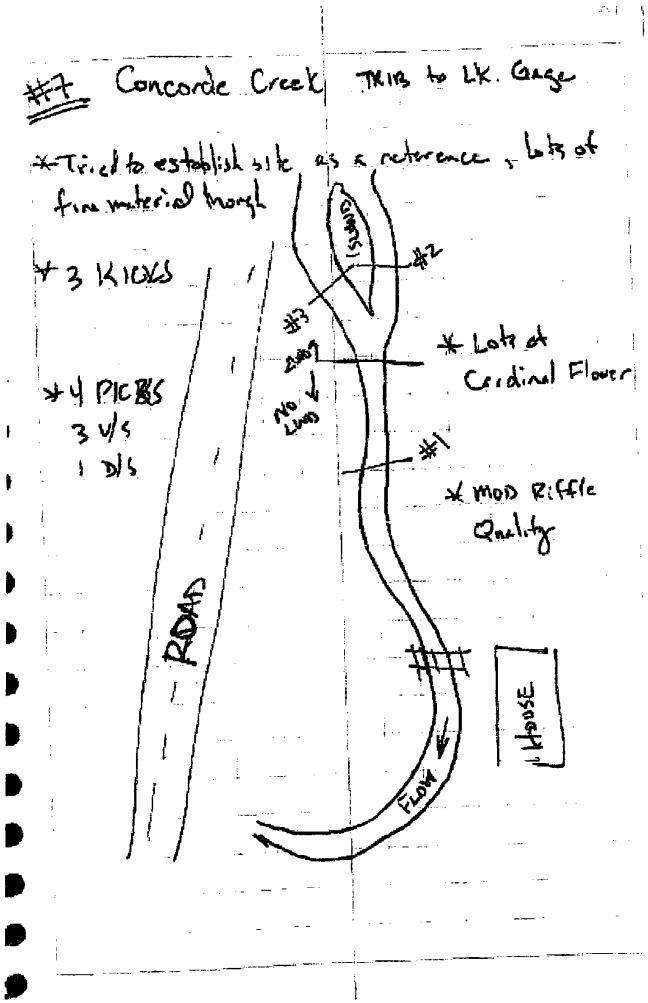
Metric	***Score***
Family Level HBI	4
Number of Taxa	2
Number of Individuals	2
% Dominant Taxa	4
EPT Index	0
EPT Count	0
EPT Count / Total Individuals	0
EPT Count / Chironomid Count	0
Number of Chironomids	4
Total Count / Count of Sub-sample Squares	2
m-IBI Score	**1.8**
QHEI Score	**65.25**

(for QHEI Metric Scores see data sheet)

Concorde Creek	
Taxon (Family or other)	Ref. Reach 8/9/2005
Annelida	
Oligochaeta	
Tubificidae	2
Mollusca	
Gastropoda	
Physidae	2
Crustacea	
Amphipoda	
Hyalellidae	2
Ephemeroptera	
Heptageniidae	2
Trichoptera	
Hydropsychidae	6
Coleoptera	
Elmidae	44
Diptera	
Ceratopogonidae	1
Chironomidae	44
Simuliidae	1
Stratiomyidae	1
TOTAL	105

Field Data

- QHEI Data Sheet
- Photos
- Field Notes
- Macroinvertabrate Bench Sheet


#7 Concorde Creek TRIB to LK. Gage
*Tried to establish site as a reference, lots of fine material though
* 3 RIFFLES
* 4 PICKS
3 U/S
1 D/S
#2
#3
#1
* Lots of Cardinal Flower
* MOD Riffle Quality
ROAD
HOUSE
FLOW

Approx. LAT: 41° 41.542' N
LON 85° 05.491' W

OhioEPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 65.25

River Code: _____ **RM:** _____ **Stream:** CONCORD CREEK (SAMPLE #7)
Date: 8/9/05 **Location:** UPSTREAM OF ORANGE RD
Scorers Full Name: Sam Brett Fields **Affiliation:** _____

1] SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % present

TYPE	POOL	RIFFLE
☐☐-BLDR /SLBS[10]	____	____
☐☐-BOULDER [9]	____	____
☐☐-COBBLE [8]	____	15
☐☐-HARDPAN [4]	____	____
☐☐-MUCK [2]	____	____
☐☐-SILT [2]	____	____
☐☐-GRAVEL [7]	____	45
☒☐-SAND [6]	90	10
☐☐-BEDROCK[5]	____	____
☐☐-DETRITUS[3]	____	____
☐☐-ARTIFICIAL[0]	____	____

NOTE: Ignore Sludge Originating From Point Sources

SUBSTRATE ORIGIN (Check ONE (OR 2 & AVERAGE))
☐ -LIMESTONE [1] ☒ -TILLS [1] ☐ -WETLANDS[0] ☐ -HARDPAN [0] ☐ -SANDSTONE [0] ☐ -RIP/RAP [0]

SILT: ☐ -SILT FREE [1] ☒ -SILT NORMAL [0] ☐ -SILT MODERATE [-1] ☐ -SILT HEAVY [-2]

EMBEDDED NESS: ☐ -EXTENSIVE [-2] ☐ -MODERATE [-1] ☒ -NORMAL [0] ☐ -NONE [1]

SUBSTRATE QUALITY (Check ONE (OR 2 & AVERAGE))
☐ -LACUSTRINE [0] ☐ -SHALE [-1] ☐ -COAL FINES [-2]

NUMBER OF SUBSTRATE TYPES: (High Quality Only, Score 5 or >) ☐ 4 or More [2] ☒ 3 or Less [0]

Substrate: 14 Max 20

COMMENTS: _____

2] INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure) **TYPE:** Score All That Occur

___UNDERCUT BANKS [1]	___POOLS> 70 cm [2]	___OXBOWS, BACKWATERS [1]	
1 OVERHANGING VEGETATION [1]	___ROOTWADS [1]	___AQUATIC MACROPHYTES [1]	
___SHALLOWS (IN SLOW WATER) [1]	___BOULDERS [1]	2 LOGS OR WOODY DEBRIS [1]	
___ROOTMATS [1]	COMMENTS:		

AMOUNT: (Check ONLY One or check 2 and AVERAGE)
☐ - EXTENSIVE > 75% [11] ☒ - MODERATE 25-75% [7] ☐ - SPARSE 5-25% [3] ☐ - NEARLY ABSENT < 5% [1]

Cover: 9 Max 20

3] CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	MODIFICATIONS/OTHER	
☐ - HIGH [4]	☐ - EXCELLENT [7]	☒ - NONE [6]	☒ - HIGH [3]	☐ - SNAGGING	☐ - IMPOUND.
☒ - MODERATE [3]	☒ - GOOD [5]	☐ - RECOVERED [4]	☐ - MODERATE [2]	☐ - RELOCATION	☐ - ISLANDS
☐ - LOW [2]	☐ - FAIR [3]	☐ - RECOVERING [3]	☐ - LOW [1]	☐ - CANOPY REMOVAL	☐ - LEVEED
☐ - NONE [1]	☐ - POOR [1]	☐ - RECENT OR NO RECOVERY [1]		☐ - DREDGING	☐ - BANK SHAPING
				☐ - ONE SIDE CHANNEL MODIFICATIONS	

Channel: 17 Max 20

COMMENTS: _____

4] RIPARIAN ZONE AND BANK EROSION (check ONE box per bank or check 2 and AVERAGE per bank) ☞ River Right Looking Downstream ☜

RIPARIAN WIDTH (L R (Per Bank))	FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN) (L R (Most Predominant Per Bank))	L R	BANK EROSION (L R (Per Bank))
☒☒ - WIDE > 50m [4]	☒☒ -FOREST, SWAMP [3]	☐☐ -CONSERVATION TILLAGE [1]	☒☒ -NONE/LITTLE [3]
☐☐ - MODERATE 10-50m [3]	☒☒ -SHRUB OR OLD FIELD [2]	☐☐ -URBAN OR INDUSTRIAL [0]	☐☐ -MODERATE [2]
☐☐ - NARROW 5-10 m [2]	☐☐ -RESIDENTIAL,PARK,NEW FIELD [1]	☐☐ -OPEN PASTURE,ROWCROP [0]	☐☐ -HEAVY/SEVERE[1]
☐☐ - VERY NARROW <5 m[1]	☐☐ -FENCED PASTURE [1]	☒☒ -MINING/CONSTRUCTION [0]	
☐☐ - NONE [0]			

Riparian: 9.75 Max 10

COMMENTS: _____

5.]POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)	MORPHOLOGY (Check 1 or 2 & AVERAGE)	CURRENT VELOCITY (POOLS & RIFFLES!) (Check All That Apply)	
☐ - >1m [6]	☐ -POOL WIDTH > RIFFLE WIDTH [2]	☒ -EDDIES[1]	☐ -TORRENTIAL[-1]
☐ - 0.7-1m [4]	☐ -POOL WIDTH = RIFFLE WIDTH [1]	☒ -FAST[1]	☐ -INTERSTITIAL[-1]
☐ - 0.4-0.7m [2]	☒ -POOL WIDTH < RIFFLE W. [0]	☒ -MODERATE [1]	☐ -INTERMITTENT[-2]
☐ - 0.2- 0.4m [1]		☐ -SLOW [1]	☐ -VERY FAST[1]
☒ - < 0.2m [POOL=0]	COMMENTS:		

Pool/Current: 3 Max 12

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH	RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS
☐ - Best Areas >10 cm [2]	☐ - MAX > 50 [2]	☒ STABLE (e.g.,Cobble, Boulder) [2]	☐ - NONE [2]
☒ - Best Areas 5-10 cm[1]	☒ - MAX < 50[1]	☐ -MOD. STABLE (e.g.,Large Gravel) [1]	☐ - LOW [1]
☐ - Best Areas < 5 cm [RIFFLE=0]		☐ -UNSTABLE (Fine Gravel,Sand) [0]	☒ - MODERATE [0] ☐ - EXTENSIVE [-1]

COMMENTS: _____ ☐ - NO RIFFLE [Metric=0]

Riffle/Run: 2.5 Max 8

Gradient: 10 Max 10

6] GRADIENT (ft/mi): 10 DRAINAGE AREA (sq.mi.) : 12 %POOL: 5 %GLIDE: _____ %RIFFLE: 60 %RUN: 35

* Sand mass must be large enough to support a population of Nto-collgate species

EPA 4520 06/24/01

Is Sampling Reach Representative of the Stream (Y/N) Y If Not, Explain:

Major Suspected Sources of Impacts (Check All That Apply):
None ☐
Industrial ☐
WWTP ☐
Ag ☐
Livestock ☐
Silviculture ☐
Construction ☐
Urban Runoff ☐
CSOs ☐
Suburban Impacts ☐
Mining ☐
Channelization ☐
Riparian Removal ☐
Landfills ☐
Natural ☐
Dams ☐
Other Flow Alteration ☐
Other:

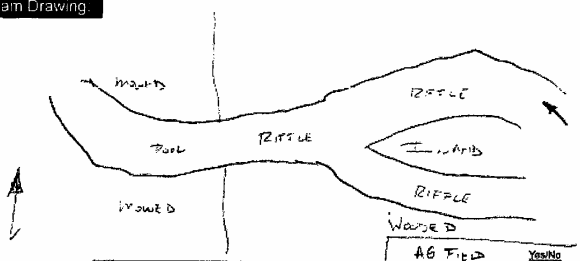
Subjective Rating (1-10)	Aesthetic Rating (1-10)	First Sampling Pass	Gear:	Distance	Water Clarity:	Water Stage:	Canopy -% Open
7	8		KICKNET		Good	LO	20

Gradient: ☐ - Low, ■ - Moderate, ☐ - High

Stream Measurements:

Average Width	Average Depth	Maximum Depth	Av. Bankfull Width	Bankfull Mean Depth	W/D Ratio	Bankfull Max Depth	Floodprone Area Width	Entrench. Ratio
7	.5	1.5						

Stream Drawing



Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3. Where: 0 - Cover type absent; 1 - Cover type present in very small amounts or if more common of marginal quality; 2 - Cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 - Cover type of highest quality in moderate or greater amounts. Examples of highest quality include very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep/fast water, or deep, well-defined, functional pools.

Yes/No	
☐☐	Is Stream Ephemeral (no pools totally dry or only damp spots)?
☐☐	Is there water upstream? How Far_____
☐☐	Is There Water Close Downstream? How Far_____
☐☐	Is Dry Channel Mostly Natural?

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OWM - BIOLOGICAL STUDIES
BENTHIC MACROINVERTEBRATE BENCH SHEET
PHASE 1 TAXONOMY

SAMPLE NUMBER _____ SITE _____ COUNTY _____ CREW CHIEF _____
LOCATION _____ HYDROLOGIC UNIT _____ DATE OF COLLECTION _____
ECOREGION _____ IASNRI _____ SORTER _____ LABEL CHECK ____

EPHEMEROPTERA
SIPHLONURIDAE (7) ____ METRETOPODIDAE (2) ____ BAETIDAE (4) ____ BAETISCIDAE (3) ____ HEPTAGENIIDAE (4) ____
EPHEMERELLIDAE (1) ____ TRICORYTHIDAE (4) ____ CAENIDAE (7) ____ OLIGONEURIIDAE (2) ____ LEPTOPHLEBIIDAE (2) ____
POTAMANTHIDAE (4) ____ EPHEMERIDAE (4) ____ POLYMITARCYIDAE (2) ____

ODONATA ZYGOPTERA
CORDULLEGASTRIDAE (3) ____ GOMPHIDAE (1) ____ ACSHNIDAE (3) ____ MACROMIDAL (3) ____ CORDULIIDAE (3) ____
LIBELLULIDAE (6) ____ CALOPTERYGIDAE (5) ____ LESTIDAE (8) ____ COENAGRIONIDAE (9) ____

PLECOPTERA
PTERONARCYIDAE (0) ____ TAENIOPTERYGIDAE (2) ____ NEMOURIDAE (2) ____ LEUCTRIDAE (0) ____ CAPNIIDAE (1) ____
PERLIDAE (1) ____ PERLODIDAE (2) ____ CHLOROPERLIDAE (1) ____

HEMIPTERA
MACROVELIIDAE ( ) ____ VELIIDAE ( ) ____ GERRIDAE ( ) ____ BELOSTOMATIDAE ( ) ____ NEPIDAE ( ) ____ CORIXIDAE ( ) ____
NOTONECTIDAE ( ) ____ PLEIDAE ( ) ____ SALDIDAE ( ) ____ HEBRIDAE ( ) ____ NAUCORIDAE ( ) ____ MESOVELIIDAE ( ) ____

MEGALOPTERA SIALIDAE (4) ____ CORYDALIDAE (1) ____ SISYRIDAE ( ) ____

TRICHOPTERA
PHILOPOTAMIDAE (3) ____ PSYCHOMYIIDAE (2) ____ POLYCENTROPODIDAE (6) ____ HYDROPSYCHIDAE (4) ____
RHYACOPHILIDAE (0) ____ GLOSSOSOMATIDAE (0) ____ HYDROPTILIDAE (4) ____ PHRYGANEIDAE (4) ____
BRACHYCENTRIDAE (1) ____ LEPIDOSTOMATIDAE (1) ____ HELICOPSYCHIDAE (3) ____ SERICOSTOMATIDAE (2) ____
ODONTOCERIDAE (0) ____ MOLANNIDAE (6) ____ LIMNEPHILIDAE (4) ____ LEPTOCERIDAE (4) ____

LEPIDOPTERA PYRALIDAE (5) ____ NOCTUIDAE ( ) ____

COLEOPTERA
GYRINIDAE( ) ____ HALIPLIDAE( ) ____ DYTISCIDAE( ) ____ HYDROPHILIDAE( ) ____ PSEPHENIDAE (4) ____ DRYOPIDAE(5) ____ ELMIDAE(4) ____
SCIRTIDAE ( ) ____ STAPHYLINIDAE ( ) ____ CHRYSOMELIDAE ( ) ____ CURCULIONIDAE ( ) ____ HYDRAENIDAE ( ) ____

DIPTERA
BLEPHARICERIDAE (0) ____ TIPULIDAE (3) ____ PSYCHODIDAE (10) ____ TABANIDAE (6) ____ ATHERICIDAE (2) ____
CHIRONOMIDAE(blood red)(6) ____ CHIRONOMIDAE(all other)(6) ____ SYRPHIDAE (10) ____ EPHYDRIDAE (6) ____ MUSCIDAE (6) ____
DOLICHOPODIDAE (4) ____ EMPIDIDAE (6) ____ CERATOPOGONIDAE (6) ____ SIMULIIDAE (6) ____ CHAOBORIDAE ( ) ____

COLLEMBOLA ISOTOMIDAE ( ) ____ PODURIDAE ( ) ____ SMINTHURIDAE ( ) ____ ENTOMOBRYIDAE ( ) ____

OTHER ARTHROPODA
ACARI (4) ____ ASELLIDAE (8) ____ GAMMARIDAE (4) ____ TALITRIDAE (8) ____ ASTACIDAE (6) ____

MOLLUSCA
GASTROPODA FERRISSIA (6) ____ HELISOMA (6) ____ LYMNAEA (6) ____ AMNICOLA (8) ____ PLEUROCERIDAE ( ) ____ VIVIPARIDAE ( ) ____
BITHYNIA (8) ____ GYRAULUS (8) ____ PHYSA (8) ____ PLANORBIDAE ( ) ____ HYDROBIIDAE ( ) ____ ANCYLIDAE ( ) ____

PELECYPODA SPHAERIDAE (8) ____ CORBICULA ( ) ____ DREISSENIA ( ) ____

PLATYHELMINTHES TURBELLARIA (4) ____ ANNELIDA ( ) ____ OLIGOCHAETA ( ) ____ TUBIFICIDAE ( ) ____ NAIDIDAE ( ) ____
HIRUDINEA ( ) ____ HELOBDELLA (10) ____ BRANCHIOBDELLIDA ( ) ____ ERPOBDELLIDAE ( ) ____ NEMATODA ( ) ____

NUMBER OF VIALS FORWARDED ____ PRELIMINARY NUMBER OF TAXA ____ NUMBER OF INDIVIDUALS ____

HBI ____ EPT COUNT ____ EPT ABUN./CHIR. ABUN. ____ CHIRONOMID COUNT ____

% DOMINANT TAXON ____ EPT INDEX ____ EPT/TOTAL COUNT ____

PHASE 1 IDENTIFICATION COMPLETED BY ____ DATE COMPLETED ____ COUNTS & CALCULATION CHECK MES

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